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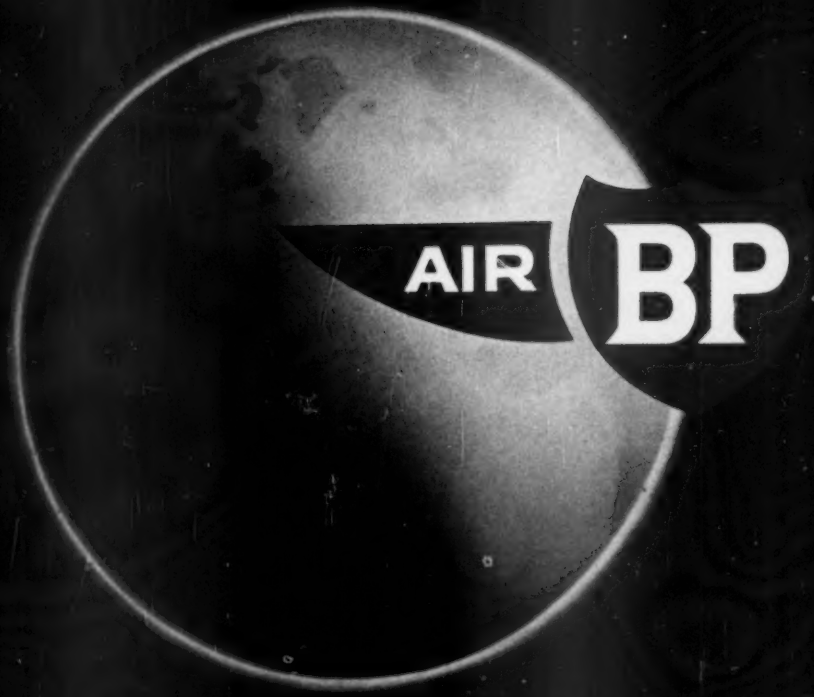

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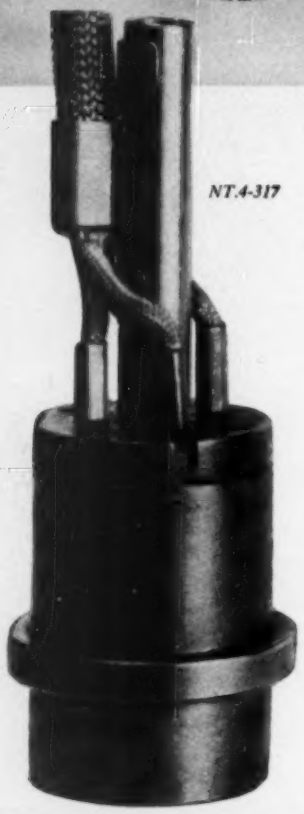

NT.4-317

GENERAL DESCRIPTION In response to customer requests, Solartron has introduced a unique pressure pickup, the NT.4-317, which combines high pressure range with high temperature characteristics. This new transducer provides a vitally needed extension of the range of data-gathering techniques by allowing continuous operation at 600° F while gauge pressures of from 100 to 5000 psi are being measured. Applications for the NT.4-317 are many and varied because of its high performance and accurate measurements in these newly opened ranges. The all-welded internal construction enables this transducer to function without the need for cooling, at up to 600°F, but a special adapter can be supplied to extend the operating range to 2000°F.

Under exclusive licence from Consolidated Electrodynamics Corporation, Pasadena, California, Solartron is to manufacture and market an ever-expanding range of pressure pickups, including types ranging from ±1 to ±5000 p.s.i. in gauge, absolute and differential models. Further information can be obtained from address below.

BRIEF SPECIFICATION

Pressure Ranges:	100 psig, 150 psig, 500 psig, 1000 psig, 1500 psig, 2500 psig, 3500 psig, and 5000 psig.
Sensitivity:	20 mV nominal, 18 mV minimum.
Excitation:	5 volts d-c or a-c (rms). Carrier frequency 0 to 20 Kc/s.
Bridge Impedance:	Input or output impedance 350 ohms ± 5%.
Pressure Limit:	150% of full rated pressure.
Compensated Temperature Range:	—65° to +600° F. Pickups operable from —350° F. to +650° F. without damage.
Zero Shift:	Will not exceed 0.02% FR/degree F. over compensated temperature range.
Thermal Coefficient of Sensitivity:	Will not exceed 0.02% FR/degree F. over compensated temperature range.
Linearity and Hysteresis:	Deviations less than ± 1.5% of full range output.*
Natural Frequency:	12 Kc/s for 100 psi, 18 Kc/s for 150 psi, and above 20 Kc/s for higher pressure ranges. Flat frequency response to 10% of the natural frequency. Frequencies of sinusoidal pressure waves or of transient pressure shocks applied to pickups should not exceed 75% of the natural frequency.
Construction:	The body and sensing diaphragm of the NT.4-317 are made in one piece without seals or joints. An homogeneous surface is thus presented to the pressure source.
Electrical Connections:	30 inches of multiple strand 4-conductor cable permanently attached to pickup.
Size:	⅝" diameter x 1¾" length, plus cable.
Weight:	30 gms. ; 38 gms. with cable.

*** NOTE:** *Each individual pickup must pass astringent inspection procedure. The Certificate of Test includes sensitivity in millivolts, linearity, and hysteresis at three stated temperatures in the pickup's operating range; zero shift with temperature; and bridge-impedance values. This data is obtained by individual calibration.*

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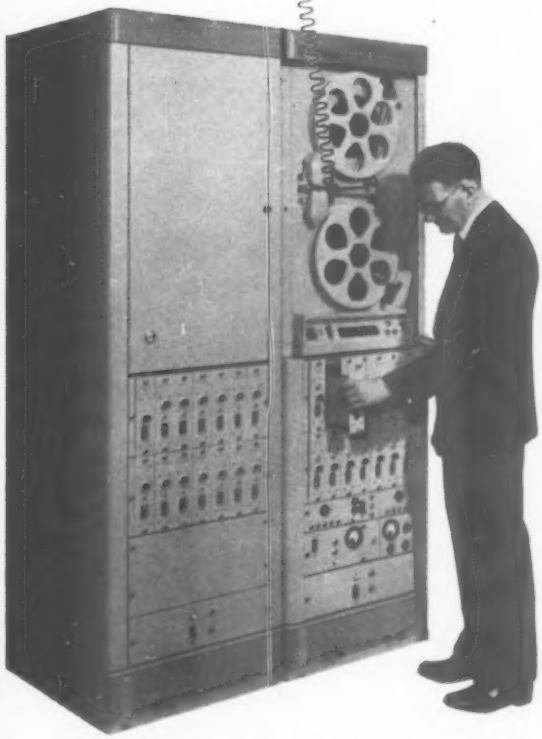

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BRIEF SPECIFICATION

WOW AND FLUTTER	Less than 0.1% peak-to-peak, measuring all components from 0 to 300 cps.
NORMAL RECORDING INPUT LEVEL	Analogue 0.5-25 volts rms. F.M. 0.5-25 volts rms. P.D.M. 0.5-25 volts rms. Input impedance 100 k.Ω
OUTPUT LEVEL	Analogue 2 volts rms. min. F.M. 2 volts rms. min. P.D.M. 2 volts peak-to-peak min.
FREQUENCY RESPONSE	Analogue 100 c/s — 100 Kc/s ±3 db. F.M. 0 — 10 Kc/s ±0.5 db. P.D.M. 50 — 1000 μsec ±2 μsec.

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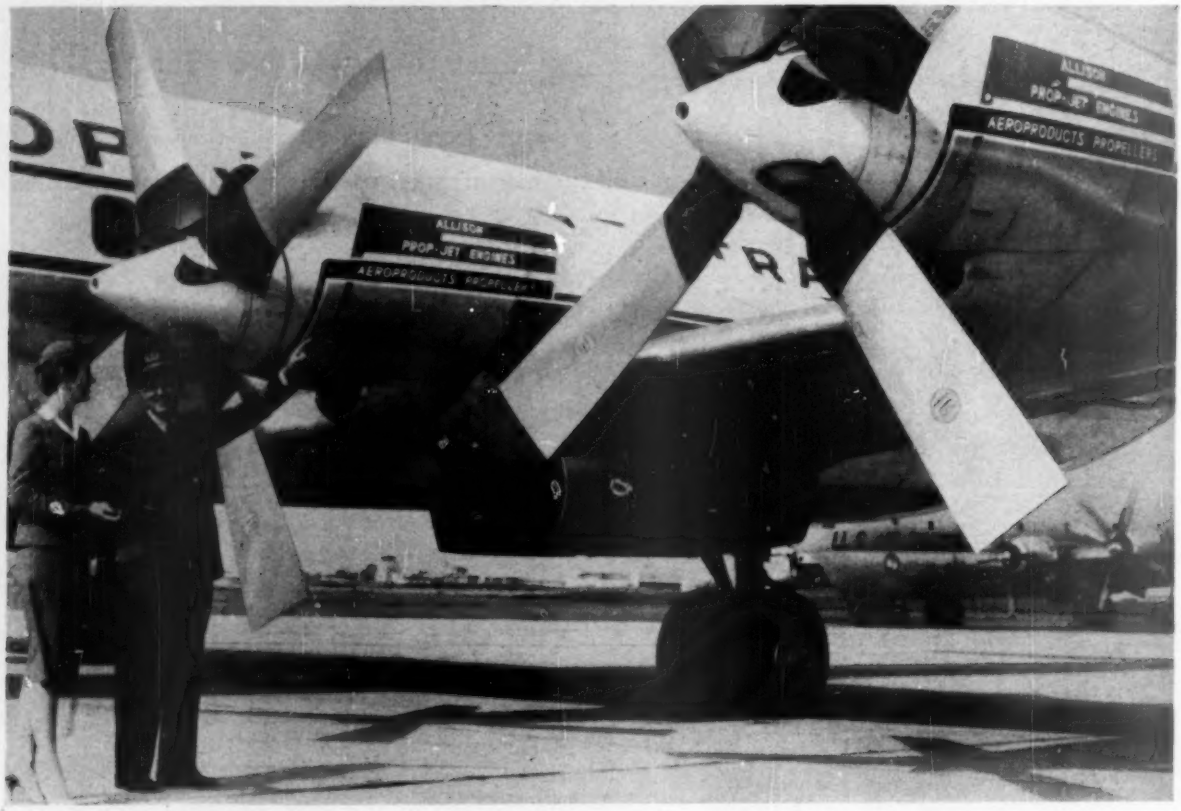

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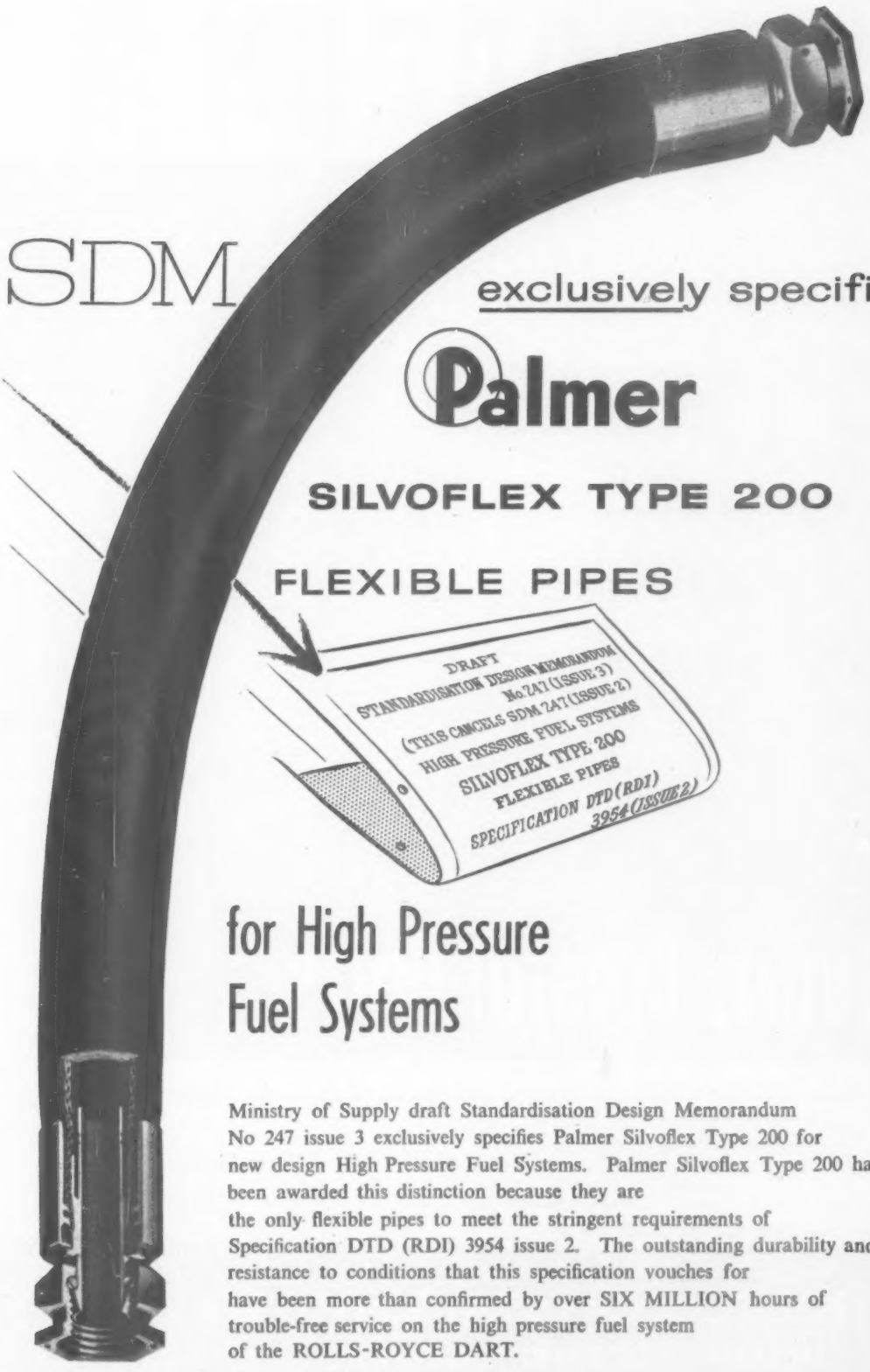

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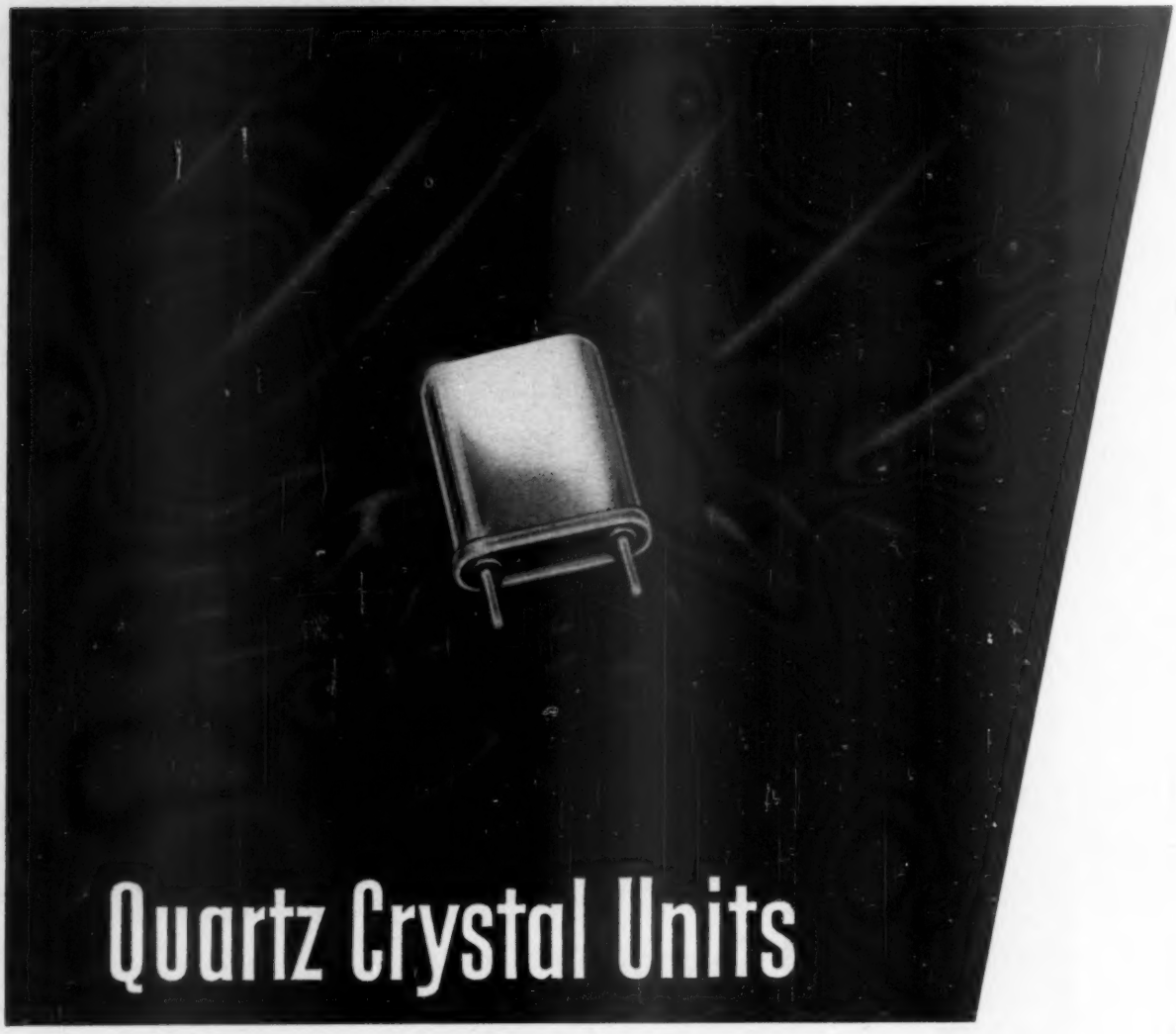

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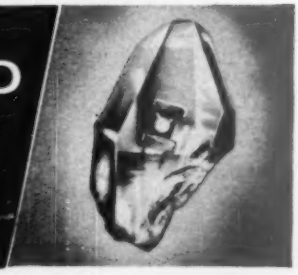

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THE AEROPLANE

Incorporating
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Edited by - - THURSTAN JAMES

Founder and First Editor
(1911-1939), C. G. GREY

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A NEW EPOCH DAWNS!

AT last man has broken free of the gravitational field of the Earth. For the first time a man-made device has been launched into space and by the time these words had been written it had travelled so far that it seemed certain to become a planetary body in the solar system. Only a year ago most people would have discounted the possibility of this being done at all and definitely not within 12 months. It will certainly cause much rueful consideration that this shattering achievement has been done under the Russian totalitarian way of life. But done it has been and life on this planet will never be the same again. The change will be just as far-reaching as that introduced when Blériot crossed the Channel which he did 50 years ago come next July! And in the same way it will not be immediately apparent. Nevertheless, nobody now will question the certainty that the people of this planet will soon be sending off manned expeditions into space. And the Russians deserve all the congratulations appertaining to those who have successfully pioneered so monumental an achievement.

It may be thought from the comparatively quiet manner in which the news has been received in this country that the Space Race is not for us. Even in the aeronautical field, the news which is occupying the interest of most people concerns the painfully long-drawn-out decision on the part of the planners to place an order for the Canberra replacement. To reach the conclusion that tactical military aircraft are still required under the shadow of the deterrent has taken two years. Another piece of news concerns the announcement by B.E.A. of its intention to order six of a developed version of the Fairey Rotodyne. No doubt the announcement has afforded some satisfaction to the directors of the Fairey Aviation Company, which has had to struggle along on a shoestring to bring this most promising development of the rotary-wing aircraft into being. The latest news that it has established a new rotary-wing record by circling 100 kilometres at just over 190 m.p.h. sets an imprimatur on the technical achievement. Nevertheless, none of us can pretend that to a global audience startled by the Russian achievement, do these pieces of news seem anything other than of comparatively parochial interest.

In the world of rocketry the great argument going to and fro behind the scenes appears to be whether we shall go on with our own Blue Streak Long Range Ballistic Missile or whether we shall go for the Polaris submarine-launched solid-fuel rocket. This argument has not come out into the open and there are those who tie it up with the appointment of Lord Mountbatten as the new Chief of the Defence Staff. However, we prefer to think along the lines so nicely set out by a writer in *The Economist* this week who remarked that Mr. Sandys is not noted for his mastery of combined operations: Lord Mountbatten is.

The extraordinary thing in this era of a contracting aircraft industry is that there is far too much for our limited capabilities in this field to undertake. We must be at pains to make ourselves clear. Our capabilities are not limited in genius, or in scientific knowledge or in industrial know-how. The limitation to our efforts lies in the economic field. It is now a truism to say that no private business can afford to develop a supersonic aeroplane. It will be accepted without argument that no private business is going to undertake ICBM development. And as for space research—most people will regard that as being far out of reach.

Yet before our industry is allowed to contract any further, and in so doing break up the teams which have taken years to get together, some responsible body (and the Lord knows we have been campaigning for one long enough!) should consider what this country, and the Commonwealth of Nations it has brought into being, ought to do.

We were once called a nation of shopkeepers, but today every country is setting up its own shop. Worse than that, such countries are setting up their own factories to supply their own shops. Our exports of aircraft and associated materials are at a splendid peak, but this can only be expected to continue if a definite government policy of spending a sufficient proportion of the national income on research and development is initiated and kept up. Nobody knows the size of our rocket effort, but it is clearly miniscule against the Russian and American efforts.

Does this mean, then, that our talents in this field are never to be developed further? Does it mean that we should concentrate on using the available segment of our economy to maintain research and development of aircraft but not of space craft? Such a decision may be very reasonable and could be the proper one to make in these days of straitened circumstances.

And yet is it in keeping with the national temperament? Somehow we do not think so. The motto of the R.A.F. is *per ardua ad astra*. Will anyone dare to say that our young men are not to be allowed to cruise among the stars?

Matters of Moment

B.E.A. and the Rotodyne

A LETTER of intent to order six of a developed version of the Fairey Rotodyne is being sent by British European Airways to the Fairey Aviation Company. This was announced by Lord Douglas, chairman of B.E.A., at the end of last week. Subject to Government financial approval, and to the meeting of the Corporation's requirements, a contract will be signed soon after the prototype of the improved version has flown. B.E.A. foresee an ultimate need for "up to 20" of these aircraft for shorter cross-Channel and domestic routes.

This positive statement of interest by B.E.A. should do much to help along a decision about the scale of further Government assistance for the development of the Rotodyne and for the extensive test and test-flying work necessary before a Certificate of Airworthiness can be obtained. One of the development problems mentioned by Lord Douglas was that of "silencing the aircraft sufficiently for it to fly into city centres."

The first firm order for the Rotodyne was placed in September last year by Okanagan Helicopters of Canada and the Kaman Aircraft Corporation has the licence for the manufacture and sale of the Rotodyne in the U.S.A.

As we go to press no detailed information is available from B.E.A. or the Fairey Company about the form which a "developed version" of the Rotodyne might take. It is certain, however, to be of greater capacity than the existing prototype, with upwards of 60 seats, and this means that higher-powered engines will be required. The selected powerplant is the Rolls-Royce Tyne, of which B.E.A. will have had ample engineering and other experience in the Vanguard before a developed Rotodyne could come into regular airline service.

Pilot as First Sea Lord

WITH the recent news of the appointment of Admiral of the Fleet Lord Mountbatten of Burma as Chief of the Defence Staff in succession to Marshal of the R.A.F. Sir William Dickson in July of this year, came the announcement that Admiral Sir Charles Lambe is to become a Lord Commissioner of the Admiralty, First Sea Lord and Chief of Naval Staff. To take up the post in May, he is at present C.-in-C., Mediterranean, and NATO C.-in-C., Allied Forces, Mediterranean.

Entering the Royal Navy in 1914, Admiral Lambe has always had a great interest in flying and qualified for a pilot's civil A Licence in 1929. For many years he flew his own aircraft. In July, 1944, he assumed command of the carrier "Illustrious" and since that time has been Assistant Chief of Naval Staff (Air) at the Admiralty; Flag Officer Flying Training; Flag Officer Commanding the 3rd Aircraft Carrier Squadron, Home Fleet, in H.M.S. "Vengeance," and Flag Officer Air (Home). He became C.-in-C., Far East Station, in March, 1953, and joined the Board of the Admiralty as Second Sea Lord in October, 1955. He took up his present post in October, 1957.

Consortium to Build TSR-2

FURTHER STEPS toward realization of the R.A.F.'s new "Canberra replacement" aircraft (THE AEROPLANE for December 26) have been taken with the selection by the Minister of Supply of the Vickers-Armstrongs (Aircraft) and English Electric companies as partners for its development. This news was released last week in an announcement by Mr. Aubrey Jones, who said that: "Subject to satisfactory negotiations, the development of the new R.A.F. aircraft, the TSR-2, will be undertaken jointly by Vickers-Armstrongs and English Electric—the main contract being placed with Vickers-Armstrongs and the work being shared between the two companies on a fifty-fifty basis. A joint project team drawn from both companies is being established at Vickers-Armstrongs' works at Weybridge for the execution of the project."

This particular choice of partners would seem to be a logical one as a move in the overall rationalization of the aircraft industry as a whole. The arrangement provides a means of preserving the Supermarine design team and their specialist knowledge of high-performance military aircraft.

No details of the TSR-2 have been given, but the Minister's statement did explain the relationship between this latest aircraft and the earlier OR339. The specification of this tactical support and reconnaissance aircraft was, he said, originally based on a General Operational Requirement—No. 339. "In the course of study it has been found technically possible to incorporate in the final Operational Requirement, modifications which will greatly increase the usefulness of the aircraft in limited operations and for close support of the Army—particularly by reducing the length and strength of runways required for take-off. While the TSR-2 will be capable of performing the rôles of all the various marks of Canberra it will, by reason of its greater flexibility and higher general performance, be far more versatile and more in the nature of a general-purpose tactical aircraft."

The statement also revealed that, "subject to satisfactory negotiations," the development of the powerplant for the new aircraft is to be undertaken by Bristol-Siddeley Engines, Ltd. The type of engine concerned was not mentioned but a subsequent Bristol statement said that it will be some later version of the Olympus—as forecast in THE AEROPLANE for September 12, 1958.

Editorial Comment appears on p. 36.

FIRST SEA LORD.—Admiral Sir Charles Lambe, the new First Sea Lord and Chief of Naval Staff. He has had a distinguished career in Naval aviation.

The Rotodyne's Speed Circuit Record

A 100-km. closed-circuit record of 190.9 m.p.h. (307.22 km.p.h.) was set up by the Fairey Rotodyne at White Waltham on January 5. This World Class record, which is subject to official confirmation by the Fédération Aéronautique Internationale, is the first to be established in the new convertiplane category recognized by the F.A.I. The interesting thing is that the Rotodyne's performance also creates a new absolute speed record for rotary-wing craft—exceeding the present helicopter speed record (held by an American Sikorsky S-56, HR2S-1) by 18% (29 m.p.h.). It also exceeds the current 100-km. closed-circuit record for helicopters (held by an American Sikorsky S-58, H-34) by 34% (49 m.p.h.).

Faireys have said that they chose to attack the closed-circuit record as this represents more closely the type of operation for which the Rotodyne is primarily intended—namely, intercity transport with vertical take-off. Also, they point out, it allows the aircraft to demonstrate under the stringent F.A.I. official conditions a genuine cruising speed over a reasonable distance. In point of fact, for the record attempt, the Rotodyne was being flown at cruising power and at an operational all-up weight consistent with the 2,800 e.h.p. delivered by its present Napier Eland engines.

It was flown by Sqn. Ldr. R. Gellatly, the company's chief helicopter pilot, who was accompanied by Lieut. Cdr. J. Morton as co-pilot.

An M.o.S. Appointment

MR. W. STRATH, C.B., M.A., has been appointed Permanent Secretary to the Ministry of Supply to succeed Sir Cyril Musgrave whose move to the Iron and Steel Board as its new chairman was announced just before Christmas (THE AEROPLANE for January 2). Mr. Strath is at present a full-time Member of the Atomic Energy Authority and will take up his new appointment in March.

Born in 1906, he was educated at Girvan High School and Glasgow University and, like Sir Cyril, spent some years (1929-38) as H.M. Inspector of Taxes at the Board of Inland Revenue. He then transferred to the Air Ministry as a Principal on the administrative side and in 1940 went in a similar capacity to the Ministry of Aircraft Production. In 1945 he became an Assistant Secretary at the Ministry of Supply and later was promoted to Principal Assistant Secretary.

In 1947, Mr. Strath became an Under Secretary to the Central Economic Planning organization and subsequently was appointed Third Secretary to the Treasury. He went to the Atomic Energy Authority in 1955, where he has been closely concerned with industrial liaison and with collaboration with overseas countries.

Departmental Neglect

THAT no really clear thinking has been applied to the question of the move of the flying clubs from Croydon to Biggin Hill is abundantly clear from the last-minute decision by the Ministry of Transport and Civil Aviation to allow club aeroplanes to fly from Croydon for a little longer—because, despite all the preliminary planning, the R.A.F. is not yet ready to accept the club aeroplanes at Biggin.

Accordingly the Ministry has decided to give a month's grace to the clubs, which may continue limited "position flying" at Croydon, subject to there being not more than 20 movements daily, until January 31. This means that instructors will fly the aeroplanes over to Biggin Hill each day, do their circuits and bumps there, and return to Croydon for refuelling, night hangarage and maintenance. Pupils will have to make their own ways to Biggin.

The delay in the wholesale move to Biggin is apparently caused by the fact that no precise negotiations have been completed regarding the occupation of buildings by the clubs and others. The clubs were not made aware that R.A.F. flying would continue after December 31, when they were initially told to vacate Croydon, but when the R.A.F. does in fact move out of Biggin Hill there will be no flying control or other facilities. It is proposed to form a consortium to operate the aerodrome, but obviously this cannot be brought into being quickly. It will entail considerable outlay on the part of the clubs, and until more details of the rents and facilities at Gatwick are available other operators cannot be expected to make any contribution towards the operation of Biggin Hill.

At Biggin at present are the eight Chipmunks of the London University Air Squadron, used mostly for A.T.C. air-experience flights, which make up to 100 movements daily.

So the sad story continues.

Sputnik Round the Sun

IT is a moot point whether the Soviet Union's successful moon rocket, Planet III, was launched on January 2 to celebrate the 21st Congress of the Soviet Communist Party, or whether that coming-of-age gathering was thrown to celebrate Russia's undoubted superiority in space research capability. Whichever it was, politically, as well as technically, the rocket at least was a complete success.

Soviet leaders are talking now of landing on the Moon, and on Mars, as though a Soviet Solar System was almost an accomplished fact. In future, for Soviet "satellites" read Soviet planets.

For reasons best known to themselves the Soviet Union preferred not to reveal how, when or where the launching sequence was initiated. The vehicle itself was stated to be a multi-stage rocket, and the final stage, less fuel, weighed 3,250 lb. Of this great mass, no less than 796 lb. represented instrumentation for recording and transmitting physical data.

Signals, it was said, were transmitted continuously on various frequencies, but with typical Soviet self-sufficiency the Russians omitted to inform the World what these were until they were sure the rocket had "escaped" Earth gravity and was on course. The Jodrell Bank radio telescope was diverted from other important work, and wasted four hours trying to pick up signals without any success. Later the Russians proclaimed that the rocket had swept past the Moon within 4,700 miles (two lunar diameters), but outside the Soviet Union no one could verify this.

On the other hand, the Soviet scientists announced that during the rocket's flight it was timed to release a cloud of sodium vapour into space that would be visible in the direction of the constellations Virgo, Boötes and Libra. Right on time, in the constellation of Virgo, on the night of January 3, a speck of light was seen to expand into a luminescent cloud. The cloud was visible to the naked eye for some eight minutes, and was sufficiently bright to be seen and photographed in Scotland, where weather conditions permitted.

Having passed the Moon sometime early in the morning of January 4, the rocket went on to take up an orbit round the Sun as predicted. Soviet astronomers calculate that the orbit will be some 214 million miles in diameter, and that at perihelion the probe will be 91.5 million miles from the sun. Radio touch was lost early on January 5.

Its period is expected to be between 15-18 months, and the

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FULL MARKS.—Piloted by Wg. Cdr. R. P. Beamont, an English Electric Lightning has been flown at Mach 2.0 in level flight over the Irish Sea. At Mach 0.95 and 35,000 ft. afterburning was brought into operation with the two Rolls-Royce Avon R.A.24R turbojets, resulting in height and speed increasing until Mach 2.0 was reached and held with "minimum reheat." The Lightning handled well although not fitted with autostabilization.

Photograph copyright "The Aeroplane"

orbit will remain close to the plane of the Earth's orbit. It is possible, therefore, that it may be recaptured at some remote age in the future, though its chances are little better than those of the planetoids Amor, Hermes, Adonis and Apollo, whose perihelions happen to fall inside the Earth's orbit at various times.

It remains to be seen what 1959 will bring in the way of expanding space research. The U.S.S.R. has now proved that it possesses a vehicle powerful enough to intercept the planet Mars when the opportunity presents itself in March, and at any time they can undertake the extremely worthwhile task of launching a Solar probe.

Such a vehicle, circling the Sun inside Mercury's orbit, in near furnace-like conditions, could gather valuable information as to the nature of the solar character. Whether the Soviet Union has the technical ability to produce instruments that could function under such arduous conditions is an open question. The World is ready to co-operate.—I. G. WHY.

---

*From Dr. L. R. Shepherd, Ph.D., B.Sc., A.Inst.P.**

Britain's Part in Exploring Space

FOR the past few days the Russian space probe has been speeding on its journey beyond the Moon. To all intents and purposes it is now free from the gravitational attractions of the Earth and Moon and is pursuing an independent orbit around the Sun. This orbit, which appears to be a fairly eccentric ellipse, occupies a region between the orbits of the Earth and Mars, though at its closest approach to Sun, the Russian vehicle will pass slightly inside the Earth's orbit.

The significance of this latest Russian achievement, following so closely upon their successful artificial satellite projects and the almost equally spectacular American shots, can hardly be lost either to the layman or the engineer and scientist. Liquid propellent rocket engines developing thrusts in the range 100,000 to 1,000,000 lb. are now in production in both U.S.S.R. and the U.S.A. and these engines, used singly or in groups, are capable of launching vehicles of several hundred tons all-up weight from the surface of the Earth. Furthermore, the remarkable strides which have been made in reducing the structural deadweight of rocket vehicles, in improving the thrust-to-weight ratios of the engines and, to a lesser extent, in increasing specific impulse, have so improved the payload characteristics that we can already think in terms of interplanetary probes with masses in the region of a ton.

Guidance techniques are also advancing rapidly, as has been demonstrated by the close approach of the Russian rocket to the Moon. That these will soon be good enough to allow probes to be placed in orbits around the Moon can scarcely be in doubt. It is equally certain that the re-entry problem is within sight of a solution and that manned satellites may be possible within the next two or three years.

These facts mean that the serious job of exploring space, first with probes carrying scientific instruments and later in the form of human expeditions, has begun. We have reached a momentous stage in the history of mankind and one that transcends all previous events in the human story. It means that man is evolving from the state of being an earthbound creature and it is an inevitable outcome of this step forward that his whole outlook will be broadened and his knowledge of nature increased immeasurably.

It is a tribute to the leaders in both the U.S.S.R. and U.S.A. that they have the imagination to realize the significance of the exploration of space and that they are prepared to dedicate a considerable proportion of their national resources to its achievement. Thoughtful people in Britain are naturally extremely anxious about our own activities in this great enterprise. They fear, and rightly so, that the failure of a highly industrialized nation, such as ours, to play a full part in these events would mark a decline in our position and would lead to a loss both in prestige and morale. Few people can have failed to note the terrific boost to the status of Russian science and engineering that has resulted from their achievements in space flight.

If Britain fails to participate in the exploration of space, it will be through no lack of interest on the part of scientists, engineers, laymen or, for that matter, political leaders. Since the Second World War there has been a widespread interest, here, in the possibilities of the rocket as a means of reaching other worlds and exploring space. No doubt the bombardment of this island by the German V2s helped to foster this appreciation, though the long tradition of scientific endeavour and achievement in exploration, which we are fortunate to inherit, must also have some bearing on the situation. Whatever the reason, there has been plenty of evidence of the interest of the public and technical circles in that, during the post-War years, there developed in this country, one of the largest astronautical societies in the World, namely, the British Interplanetary Society.

The B.I.S. was founded in actual fact, in 1933 by Phillip Cleator and it has just recently celebrated its silver jubilee. In the years prior to the War its numbers were small and included a mere handful of enthusiasts. Since 1945, however, it has grown rapidly and in just over 10 years its membership has exceeded 3,000. The fact that almost one-third of the members reside overseas, notably in the U.S.A. and the Commonwealth, is taken as an indication that the work of the Society has been appreciated in other countries.

The British Interplanetary Society is one of a number of astronautical societies which make up the International Astronautical Federation. The International Astronautical Congress (annually held by this body) has already been staged in London on one occasion, namely, in 1951 when the theme was "The Artificial Satellite" and for the first time engineers and scientists of many countries gathered together to discuss the problems of satellite launching. On that occasion the B.I.S. acted as the host-Society and organized the Congress on behalf of the I.A.F. This year the B.I.S., once again, is playing host at the Tenth International Astronautical Congress, which is scheduled to take place at Church House, Westminster during the week commencing August 30. The I.A.F. Congress has become one of the major meetings in the field of astronautics.

The existence of an active astronautical society in Britain, of course, is no substitute for actual research and development. It is vital that such work should be planned and carried out. At the present time the work that is in progress in this country is largely tied up with the defence programme and as such it is liable to fluctuate with day to day political views. Considerations of the respective merits of aircraft as against missiles, and of solid versus liquid propellent rockets are important to the defence policy, but in the field of space flight, at least in its present phase, it is the liquid propellent rocket that is of primary importance and for that reason it is vital that research and development into large liquid propellent engines and vehicles of the Blue Streak and Black Knight types should be pushed ahead. Guidance, re-entry and other problems relevant to astronautics should also continue on a reasonable priority. These developments should proceed smoothly and ought not to be governed by the uncertainties of defence policy.

It is, of course, necessary to take a realistic view of our technical resources in assessing Britain's future rôle in astronautics. Scientific manpower in this country is still woefully inadequate and we do not have the large reserves and resources which the United States is able to throw into the enterprise. To expect that we could, on our own, compete on an equal footing with the U.S. and U.S.S.R. would be wishful thinking. This does not mean that we should do nothing; it means, rather, that we must be careful in the way we use such resources as we have, that we must be scientific in our approach and that we must pay particular attention to long-range research. Above all, however, it implies that we should be prepared to work in partnership with other countries.

Ideally, a completely international enterprise is the thing that most of us would like to see. We are, however, still rather a long way from the Utopian state of international affairs that would make this possible and in the interim it is desirable that the U.K. should look to other possibilities. In this respect there would appear to be three major avenues of collaboration, namely:—

(a) to work as a junior partner to the U.S.A.

(b) to work in collaboration with other nations of Western Europe.

(c) to work with our sister nations in the Commonwealth.

Probably, it is the last of these which would appeal most strongly to our sentiments and, in the long run, bearing in mind the growing power and vast resources of some of the younger Commonwealth nations, particularly Canada, this might be a good solution.

* Chairman, British Interplanetary Society.

New Year Honours

A SUPPLEMENT to the *London Gazette* published on December 30 contained the following civil and military New Year Honours conferred by Her Majesty the Queen.

KNIGHTHOOD

Aubrey Francis Burke, O.B.E., deputy chairman and managing director, de Havilland Aircraft Co., Ltd.; Maj.-Gen. Charles Anderson Lane Dunphie, C.B., C.B.E., D.S.O., managing director, Vickers, Ltd.; Air Cdre. Henry Percy Smyth-Osbourne, C.M.G., C.B.E., J.P., D.L.—for political and public services in Devon; Kelvin Tallent Spencer, C.B.E., M.C., chief scientist, Ministry of Power.

ORDER OF THE BATH

Knight Grand Cross (Military)

Air Chief Marshal Sir George H. Mills, K.C.B., D.F.C.

Knights Commanders (Military)

Air Marshal W. H. Merton, C.B., O.B.E.; Acting Air Marshal W. M. L. MacDonald, C.B., C.B.E., D.F.C.; Vice-Admiral A. N. C. Bingley, C.B., O.B.E.

Companions (Civil)

Air Cdre. A. R. Churchman, D.F.C., D.L., chairman, Territorial and Auxiliary Forces Association, Belfast; M. M. V. Custance, Deputy Secretary, M.T.C.A.; G. S. Whittuck, Assistant Under-Secretary of State, Air Ministry.

Companions (Military)

Air Vice-Marshal G. Silyn-Roberts, C.B.E., A.F.C., M.Sc., F.R.Ae.S.; Air Commodores R. H. E. Emson, C.B.E., A.F.C.; W. D. J. Michie; M. K. D. Porter, C.B.E.; V. H. B. Roth, C.B.E.; S. C. Widdows, D.F.C. (retd.); Acting Air Commodore H. I. Edwards, V.C., D.S.O., O.B.E., D.F.C.

ORDER OF SAINT MICHAEL AND SAINT GEORGE

Companions

S. F. Follett, Director-General, M.o.S. Staff, British Joint Services Mission, Washington; B. G. Barnard, Civil Air Attaché, Her Majesty's Embassy, Beirut.

ROYAL VICTORIAN ORDER

Members—Fifth Class

Sqn. Ldr. G. C. D. Goodyer, R.A.F.; Sqn. Ldr. B. G. T. Stanbridge, A.F.C., R.A.F.

ORDER OF THE BRITISH EMPIRE

Knight Commander (Civil)

G. W. H. Gardner, C.B., C.B.E., director, R.A.E., M.o.S.

Knights Commanders (Military)

Air Marshal H. D. Jackman, C.B., C.B.E.; Acting Air Marshal C. E. Chilton, C.B., C.B.E.

Commanders (Civil)

S. E. Clotworthy, managing director, Northern Aluminium Co., Ltd.; M. Cook, chairman, Metals Division, Imperial Chemical Industries, Ltd.; E. C. de Rougemont—for services to the R.A.F. Benevolent Fund; F. C. Fayers, Assistant Secretary, Air Ministry; J. A. Ratcliffe, O.B.E., chairman, Radar and Signals Advisory Board, M.o.S. Scientific Advisory Council; K. Robson, M.D., F.R.C.P., civil consultant in medicine to the R.A.F.; R. H. Schlotel, Director, Engine Research and Development, M.o.S.

Commanders (Military)

Group Captains C. B. E. Burt-Andrews; W. H. Canniford; R. K. Cassels, D.F.C., A.F.C.; W. G. Devas, D.F.C., A.F.C.; T. J. Hanlon; E. J. Morris, D.S.O., D.F.C.; J. C. Pope, M.I.Mech.E., A.F.R.Ae.S.; F. C. Richardson (retd.); E. V. Stokes, B.Sc.; D. E. B. Wheeler, D.F.C (retd); R. D. Williams, D.F.C.

Left to right, Mr. M. M. V. Custance (C.B.); Mr. S. E. Clotworthy (C.B.E.).

Mr. A. F. Burke (Knighthood); Air Chief Marshal Sir George H. Mills (G.C.B.).

Vice-Admiral A. N. C. Bingley (K.C.B.); Mr. G. W. H. Gardner (K.B.E.).

Officers (Civil)

G. F. W. Adams, Principal, Air Ministry; T. Bancroft, production and works director, Blackburn and General Aircraft, Ltd.; D. L. Brown, Assistant Director, Engine Research and Development, M.o.S.; Gp. Capt. J. Bussey, lately Assistant Director (Air), Directorate of Overseas (Geodetic and Topographic) Surveys, Colonial Office; G. S. Cooper, M.B.E., Superintending Civil Engineer, Grade I, Air Ministry; C. H. Eastop, M.B.E., Chief Executive Officer, Air Ministry; L. Essen, Senior Principal Scientific Officer, N.P.L.; F. C. Everett, Principal Scientific Officer, Armaments Production Division, M.o.S.; D. J. Farrar, chief designer, guided weapons, Bristol Aircraft, Ltd.; G. W. Harvey, Principal, M.T.C.A.; H. S. Humphreys, M.B.E., lately Deputy Director of Contracts, M.o.S.; J. Middlemas, Air Traffic Control Officer, Grade I, Prestwick Airport, M.T.C.A.; P. W. Mummery, Senior Principal Scientist, Reactor Division, A.E.R.E., Harwell; The Reverend R. L. Small, member, Scottish Air Cadet Council, and Regional Chaplain, Air Training Corps, Scotland; Major P. L. Teed, deputy director, Department of Aeronautical Research and Development, Vickers-Armstrongs (Aircraft), Ltd.; M. N. Oxford, Director of Civil Aviation, Federation of Malaya.

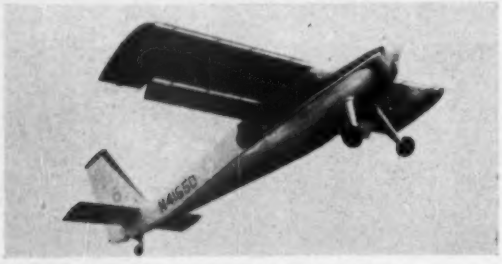
Officers (Military)

Acting Group Captain A. S. Knowles, A.F.C., A.F.R.Ae.S.; Wing Commanders A. S. Baker, D.F.C.; W. K. Bell; G. Davidson; J. Eames, D.F.C., A.C.A.; N. H. Gosden (retd.); A. H. Hewitt; N. E. Hext, M.B.E.; W. McRobbie, A.F.C.; E. W. Merriman, M.B.E., D.F.M.; A. J. Morgan, A.F.C., A.F.M. (retd.); H. A. Pritchard; J. R. Pullan, A.C.A.; J. Rayson, A.F.C.; The Rev. W. G. Reeves; Wing Commander J. K. Silver, B.Sc.; Acting Wing Commander W. L. Milburn, R.A.F.V.R.; Squadron Leaders K. Dear, D.F.C.; H. A. Penny; F. E. Reed (retd.); Acting Captain M. Bruce, R.N.

QUEEN'S COMMENDATIONS FOR VALUABLE SERVICE IN THE AIR

Lieut. Cdr. J. Elliot, A.F.C., R.N. (retd.), chief test pilot, de Havilland Aircraft Co., Ltd. (Christchurch); Capt. H. J. Field, Senior Captain, First Class, B.O.A.C.; Sqn. Ldr. H. G. Hazelden, D.F.C., chief test pilot, Handley Page, Ltd.; Capt. P. J. McKeown, Senior Captain, First Class, B.E.A.; Capt. A. Meagher, D.F.C., Deputy Flight Manager, Britannia 312 Flight, B.O.A.C.; J. Miller, Flight Radio Officer, B.O.A.C.; G. W. Rodgers, Radio Officer, Grade "A," B.E.A.

News of Aircraft, Engines and Missiles



STOL TYPE.—The latest version of the Helioplane is the 395 Super Courier (295-h.p. Lycoming GO-480), which can carry a useful load of about 1,000 lb. operating from a standard 400-ft. STOL-pad at Teterboro Air Terminal, New Jersey. The cruising speed is 170 m.p.h.

FRIENDSHIP STRENGTHENED.—As a result of water-tank fatigue testing, the centre-wing lower skin of the Fokker Friendship appears to be less fatigue-resistant than the remainder of the structure. Cracks appeared in rather rapid succession between 15,000 and 20,000 simulated flights. The production wing has, therefore, been modified—by increasing skin and stringer thickness—to reduce the overall stress level by about 30%.

DEARER TIGERS.—Rollason Aircraft and Engines, Ltd., announces that as from January 20 the basic cost for a standard rebuilt D.H. Tiger Moth will be £825 ex-works. This higher price has resulted from increases in manufacturing costs, but up to January 20 orders will be accepted at the present figure of £750, even though delivery is made after that date.

WEAPON HANDICAP.—Sir Owen Wansbrough-Jones, chief scientist to the M.o.S., is reported as saying in Ottawa that the British weapon-development programme had been handicapped more by lack of trained and capable personnel than by a shortage of money.

RUSSIAN RESCUE.—Shortly before Christmas the Russian Antarctic pilot Victor Perov located and rescued four Belgian explorers who had forced-landed in a ski-equipped Auster. Perov was flying a ski-equipped Li-2 (Russian Dakota), No. 495, which discovered the Belgians when running short of fuel, and flew them back to their base. Perov has since been awarded the Order of Lenin for this achievement.

AVIATION FUELS.—Shell-Mex and B.P., Ltd., has announced an increase of ½d. per gal. in the wholesale price of aviation turbine fuels.

CARAVELLE SUPPORT.—A closer collaboration between Sud-Aviation and Republic is expected to result from negotiations which started recently. As a result, Republic will provide support services to Caravelle customers in North America.

S.A. AND PORTUGAL.—A Portuguese mission is to visit Prestwick to see the Twin Pioneer production line and to discuss details of a possible agreement with the builders. If an order is placed it will be for more than 36 aircraft—the largest contract to come to the company, being valued at about £2.25 million.

SIKORSKY CONTRACT.—The Sikorsky HSS-2 (S-61) amphibious anti-submarine helicopter has been ordered into production under a $17 million U.S. Navy contract. Powered by two G.E. T58-GE-6 shaft turbines it will have all-weather flying capabilities; the first aircraft is scheduled to fly in March. A mock-up was illustrated in THE AEROPLANE for September 5, 1958.

CF-100 FINALE.—The 692nd and last CF-100 all-weather fighter left the production lines of Avro Aircraft, Ltd., at Malton, last month. CF-100s equip 13 squadrons of the R.C.A.F., including four in Europe, where they are also serving with the Belgian Air Force. Production of the Avro Orenda engine used by the CF-100 and Canadair Sabre ended a few weeks earlier, 3,794 having been built.

A GLIDING TRUST

RECENTLY formed is the Shaw Slingsby Trust, Ltd., which is an outcome of the death, in 1955, of Maj. J. E. D. Shaw, the founder of Slingsby Sailplanes, Ltd. His executors found it necessary to dispose of his interest in the company, but in the formation of this Trust the names of two families notable in British gliding will be permanently identified. Slingsbys will continue trading as before, but distributed profits will go to the Trust, which will support the gliding movement in a way similar to the Kemsley Flying Trust.

The first council members of the Trust are Messrs. Philip Wills, John Furlong and Basil Meads; the registered office is at 25 City Road, London, E.C.1.

BALLOONISTS IN NEW WORLD.—A report from Port of Spain, Trinidad, on January 5 stated that the crew of the transatlantic balloon "The Small World" had landed safely at Crane Beach, 13 miles from Bridgetown, Barbados, at 16.05 hrs. G.M.T., having sailed the last 1,800 miles in the boat-type gondola. The balloon left Teneriffe on December 12. The four crew were well and their equipment was intact.

VAUTOUR CENTURY.—Sud-Aviation has produced its 100th S.O. 4050 Vautour (two SNECMA Atar 101E axial-flow turbojets). It was one of the N type, the two-seat all-weather fighter version.

Commercial Aviation Affairs

B.O.A.C. GIRDLE.—Subject to approval from the U.S.A. and Japan, B.O.A.C. proposes this spring to extend its westbound Britannia 312 services to Tokyo and Hong Kong, via San Francisco, Honolulu and Wake Island. At the same time Comet 4s will come into service on the easterly Hong Kong and Tokyo runs, completing an all-turbine-powered round-the-World route.

SIX COMETS.—On December 31 B.O.A.C. took delivery of their sixth Comet 4 (G-APDF). Since October 4 the Corporation's Comets have logged some 2,000 flying hours with passenger load-factors averaging 80%. The next three Comet 4s from the Hatfield line are due to go to Aerolineas Argentinas, with the D.H. Chester factory completing the remaining Comets for B.O.A.C.

PAKISTAN'S VISCOUNTS.—The first of five Viscount 815s (AP-AJC) for Pakistan International Airlines was handed over at Wisley last Friday to the Pakistan High Commissioner in London. The original order was for three aircraft, but an order for a further two was announced on Friday; the fifth aircraft will be completed in October this year. The 815s will have mixed-class layouts and the first will be ferried out to Karachi later this month. Total Viscount orders now stand at 404.

NO-PASSPORT FLIGHTS.—As briefly recorded in last week's issue, both Silver City and Air Charter will this year be flying day-trip, no-passport passengers between the U.K. and the Continent. Silver City's Lydd—Le Touquet day-return (65s.) services will operate from March 26 to September 30; Air Charter's services between Southend and Calais (79s. to and from Central London) will start before the end of this month.

DC-8s AND ELECTRAS.—Northwest Orient Airlines have now completed arrangements for their previously announced order for 10 Lockheed Electras, with two more on option. At the same time an order from Northwest for five long-range DC-8s, with an option on four others, has been confirmed. The DC-8s will have a total fuel capacity of 19,407 Imp. gal. and a maximum permissible take-off weight of 310,000 lb. The Electras will also, as already recorded, have increased tankage for non-stop transcontinental operations.

Mr. Dennis Handover, whose new appointment is noted below.

AIRCRAFT EXCHANGE.—Mr. Dennis H. Handover has been appointed U.K. and European representative in London for Aircraft Exchange, the aims and activities of which were explained in THE AEROPLANE of December 26 (p. 923) and December 19 (p. 884). Mr. Handover's experience in air transport, mainly on the traffic side, extends over 38 years; he is perhaps best known to post-War members of the industry as, until 1954, chairman of Scandinavian Airlines System in the U.K. For the time being he will operate from 46 (Flat 19) Upper Grosvenor Street, London, W.1 (Grosvenor 3504). The first list of aircraft prices to subscribers in the U.K., Europe and elsewhere was issued by Aircraft Exchange in New York on January 6. The latest membership figure is 67.

SOUTHEND TAKES OVER.—On Christmas Eve, when most of the U.K. airports were fog-bound, Southend handled 52 diversions in addition to its normal traffic. These diversions were possible largely because of the airport's G.E.C. high-intensity runway lighting system. The diverted aircraft included two DC-6s, two Constellations, two Convairs and more than 30 Viscounts. The airport was eventually closed to traffic because all aprons and taxiways and the sub-runway were occupied by parked aircraft.

YEADON HOLD-UP.—At the time of going to press no agreement had been reached between the Leeds and Bradford Corporations and Yeadon Aviation over the purchase of equipment, such as radio and lighting systems, without which the airport cannot be operated. The corporations were expected to take over the airport as a going concern from Yeadon Aviation on January 1 after derequisitioning by the Air Ministry on December 31.

HIGH-LEVEL FORECASTING.—New services for civil jet operations are being provided by the U.S. Weather Bureau, including forecasts for flight levels between 20,000 ft. and 45,000 ft. for domestic and international flights from major airports, and a new type of "prognostic wind flow charts" prepared with the help of an electronics computer and covering more than half the Northern hemisphere.

C.A.A. MOVE.—Following the recent establishment in the U.S.A. of the Bureau of Research and Development (previously the Airways Modernization Board) in the Federal Aviation Agency there will be consolidation of the work being done. All major activities of the C.A.A. Technical Development Center at Indianapolis will be transferred before June 30 to this Bureau, or to the National Aviation Facilities Experimental Center (N.A.F.E.C.) at Atlantic City, New Jersey.

ANTARCTIC AIRPORT.—The Australian Department of Civil Aviation is taking first steps early this year to investigate the establishment of an airport in Antarctica. A Department of Civil Aviation airfield engineer (Mr. B. Coombes) was due to leave on January 5 aboard the Danish freighter "Magga Dan" with a party which will take over the former U.S. base of Wilkes, on Vincennes Bay, in the Australian sector and about 2,100 miles south-west of Hobart.

HERON HANDOVER.—The first aircraft to be registered in Ghana, 9G-AAA, one of two D.H. Herons for Ghana Airways, was handed over at Hatfield on December 30. At the ceremony were, left to right, Mr. T. Ephson, Mr. Peter de Havilland, Mr. J. Jantuah (Deputy High Commissioner for Ghana), Mr. G. M. Johnson (B.O.A.C. delivery pilot), Mr. A. G. Edwards and Mr. J. B. Odunton.

CARAVELLES TO LONDON.—In addition to the Caravelle services outlined in our previous issue (see page 25), Air France will introduce the type between London and Paris in June or July this year, starting with one round trip each day. The daily Caravelle service between London and Nice will begin in mid-June.

DOPPLER DELIVERIES.—Deliveries of the Canadian Marconi Doppler navaid to Pan American began in November. The equipment is to be used in the Boeing 707-121s.

VASP LOSS.—On December 30 a Saab Scandia of Viacao Aerea Sao Paulo crashed into the sea shortly after taking off from Santos Dumont Airport, Rio de Janeiro. Of 33 passengers and a crew of four there were, according to latest reports, 16 survivors.

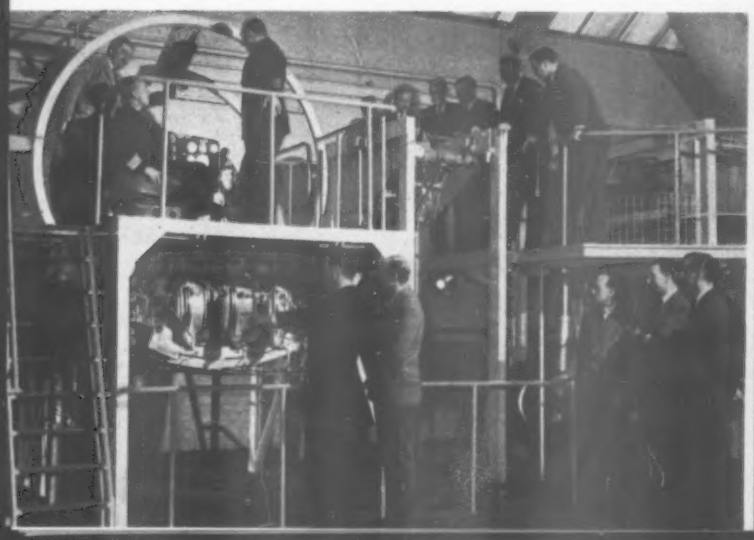
TRANSPORT FUTURE.—The managing director of Hunting-Clan Air Transport, Mr. M. H. Curtis, will lecture to the Tees-side section of the Institute of Transport on "Air Transport—Chaos or Progress Ahead," on January 16, starting at 18.30 hrs., at the Cleveland Scientific and Technical Institution, Middlesbrough.

FAIRCHILD PRESIDENT.—Mr. James H. Carmichael, lately president of Capital Airlines, has been elected president of Fairchild Engine and Airplane Corp. in succession to Mr. Richard S. Boutelle, who remains vice-chairman and a member of the executive committee. Mr. E. Ainsworth Eyre has resigned.

TEAL PROFIT.—At £A.357,469, the profit made by TEAL in the year ended March, 1958, was a record. Gross revenue rose to £A.2 million and the C.T.M./employee figure rose from 19,799 to 20,985.

(*More news on page 53*)

PREPARATION.—The first Comet 4B aircrew training course for B.E.A. personnel is now under way at the de Havilland Servicing School, Hatfield. Seen here, below left, B.E.A. pilots and ground engineers study the Comet's power-control system on one of the school's large training rigs. Below, right, Capt. W. Baillie, M.V.O., O.B.E., general flight manager, B.E.A., and Capt. G. T. Greenhalgh, M.B.E., flight manager designate, Comets, discuss training with Mr. D. W. Richardson.



Air Transport

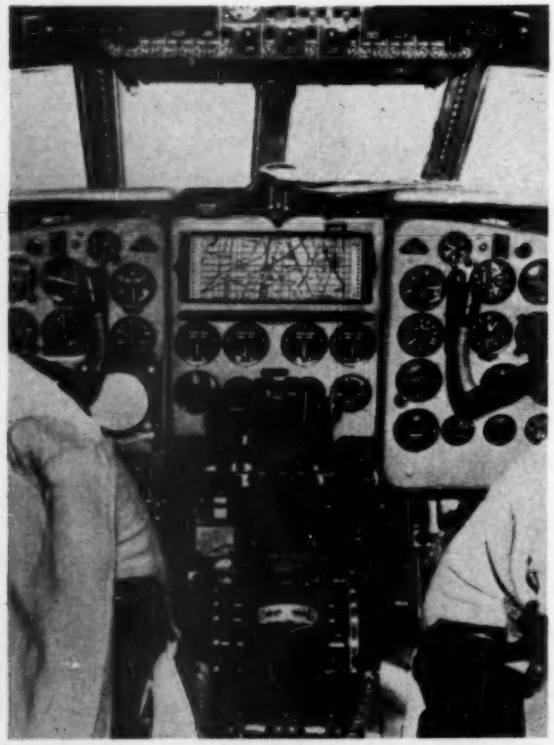
Help Where Needed

BY its decision to include Vickers as a major partner in the TSR-2 Canberra-replacement development programme, the Government appears at last to have recognized that civil aircraft development cannot be undertaken "in a vacuum"—however powerful the company or group of companies concerned might be. A year or so ago, the Government forced the industry to finance privately our two major new civil transport projects for the next five years—the V.C.10 and the D.H.121. Desirable as this may seem in principle, it has not been widely enough realized that it is only possible in practice with an industry that is soundly based financially—which can only mean adequate military contracts.

On the DC-8, Douglas have to date expended not far short of £100 million. The V.C.10 programme would be rather more modest, but this gives an idea of the scale of expenditure required. It is not too much to say that without Government support of some kind, direct or indirect, no new civil transport can again be successfully developed by Britain. This argument has prevailed in the face of what must have been a very strong case indeed for giving the TSR-2 contract to the Hawker Siddeley Group's Aviation Division.

Choice of the Bristol Olympus engine for the TSR-2 is also significant in the civil field, since it will make it possible for work to continue on the extremely promising range of turbo-fan engines based on Orpheus components. With powers running well into the five-figure bracket, these engines offer to make practicable the really short-haul turbojet transport such as the Bristol 205 or the DC-9 and Boeing 727. Bristol Aero-Engines and Armstrong Siddeley Motors are to merge into a single operating company to develop the engines for the TSR-2, and the turbo-fan engines will be among the projects tackled by this new company.

Last week's announcement about the Canberra replacement therefore gives some reason to believe that Britain's civil aircraft development programme has not been quite forgotten by the Government. Further action is urgently required, however, to ensure the success of other types under development. Let us hope for 1959, therefore, that R.A.F. Transport Command will be encouraged to buy the Armstrong Whitworth Argosy; that de Havilland and Fairey will continue to have a large enough volume of business to enable them, with Hunting Aircraft, to finance the D.H.121; and that all Britain's new transports will in future be helped through the flight development and proving stages by one of the two State corporations, one of the larger independent operators, or R.A.F. Transport Command.



This picture, showing the position of the Decca Flight Log in the Comet 4 control cabin, is interesting because it shows that the Log will replace the turbine r.p.m. and jet-pipe temperature dials. Following present trends towards providing, when a flight engineer's position is included, only essential "go/no-go" engine information for the pilots, this arrangement leaves them with the four power-loss indicators as their guides to engine behaviour.

B.O.A.C. to use Decca/Dectra

FOLLOWING a long period of evaluation, B.O.A.C. have decided to equip their North Atlantic Comet 4s with Decca/Dectra. The announcement was due to be made yesterday, January 8, but it had been generally understood for some months that the Corporation would, in due course, fit this equipment—especially as Decca and Dectra have the official support of the M.T.C.A. as primary short- and long-distance navigation aids.

When describing the methods and problems of Comet 4 operation over the North Atlantic in the issue of October 24, 1958 (pp. 610-621), the assumption was made that Decca/Dectra would eventually be installed, but the references were deliberately oblique because the Corporation was not then in a position to say positively that this equipment would be used.

Earlier (see the issue of July 11, p. 56) an objective evaluation report from Pan American Airways had shown this carrier to be generally in favour of the system, so there is a reasonable chance that this and other major North Atlantic operators, such as T.C.A. and S.A.S., may agree to use the system and we shall be approaching a situation in which closer lateral and longitudinal separations will be universally applicable over this difficult area.

Apart from trials by B.O.A.C. (with a Comet 2E) and other operators, the Dectra North Atlantic coverage has been checked by the M.o.S. using a Valiant, and Decca/Dectra is being demonstrated by the M.T.C.A. using the M.o.S. Comet 2E from London Airport (January 19-23), Paris (January 26), New York (February 2 and 4) and Montreal (February 6) where it will be based for the ICAO navaids conference.

Another Maybury Report?

RECENT comments and news stories about the year-old policy of the Ministry of Transport to try to off-load a few airports on to the municipalities, cause one to wonder whether ratepayers really do understand just what airport ownership can mean today.

To be sure, the municipalities know quite well that the Ministry would not be trying to get them to take back their airports if there were much to be made out of them; they are well aware that money will have to be spent and that any financial returns are likely to be in the far-distant future. But do they really understand and accept the basic facts of the business? That, for instance, an airport run, however efficiently, on a shoestring will not be capable of handling the services of major operators; and that traffic-potential justification must be found before embarking on the kind of extensions and improvements which would make international-standard operations possible?

The onlooker's impression is that the individuals who form the corporate entities of municipalities know these things perfectly well—but only with their minds; their emotions, so to speak, tend to drive them, often for reasons of prestige, to actions based on a vague confidence in the inevitable expansion of air transport. So far, the dictates of the head—coupled with the effect of a healthy fear of the ratepayers—seem to be winning; there have been no successful take-over bids since Ringway was returned to Manchester Corporation.

The time has come for the Ministry to offer some sound guidance to the various municipalities—and this, it seems, is

(Continued on page 37)

It's proof like this that sells me the VISCOUNT

Capital Airlines figures emphasise original economy claims of the Viscount 700

These figures are taken from a study of operating costs recently made by Capital Airlines. The original estimates made in May, 1954, are compared with actual costs experienced in service.

Cost per aircraft-hour flown	*Original Estimate*	*Actual 6-months period ended 30th June, 1958*
DIRECT EXPENSE		
Pilots' salaries, travel; engine fuels; hull insurance; etc.	$ 96.15	$ 95.85
Direct maintenance labour, materials	57.76	47.12
Aircraft depreciation	45.91	46.36
Total direct expenses	199.82	189.33
INDIRECT EXPENSES		
Assigned expenses (of all other elements of operating expense allocated to types of aircraft on a formula basis)	$169.52	$169.20
Total operating expense	369.35	358.53
Costs per revenue aircraft-mile flown		
DIRECT EXPENSE		
Pilot's etc.	$ 0.402	$ 0.383
Direct maintenance	0.242	0.188
Aircraft depreciation	0.192	0.185
Total direct expense	0.836	0.756
INDIRECT EXPENSE		
Assigned expense	$ 0.709	$ 0.697
Total operating expense	1.545	1.453

It's experience—backed by figures like these—that is built into the Viscount 810/840

VICKERS VISCOUNT 810/840

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Men of Skill and Experience

VICTOR ARNOLD LAWSON

Shell Fuelling Crew Foreman
at Palisadoes Airport, Kingston, Jamaica.

ONE OF THE MEN RESPONSIBLE FOR SHELL WORLD-WIDE SERVICE

SHELL

Scheduled Air Transport Traffic Development, 1945-1958

Year	Miles flown	Hours flown	Passengers carried	Passenger-miles	Pass.-mile increase over previous year	Cargo ton-miles	Mail ton-miles
	Millions					Millions	
1958 ..	1,845	9.0	89	53,500	+ 5%	1,145	320
1957 ..	1,750	8.6	86	51,000	+ 16%	1,135	300
1956 ..	1,580	8.0	77	44,000	+ 15%	1,040	280
1955 ..	1,430	7.4	68	38,500	+ 17%	910	260
1954 ..	1,290	6.7	58	33,000	+ 13%	775	225
1953 ..	1,195	6.4	52	29,000	+ 16%	720	190
1952 ..	1,100	6.0	46	25,000	+ 14%	685	180
1951 ..	1,010	5.6	42	22,000	+ 25%	640	165
1950 ..	895	5.0	31	17,500	+ 17%	530	135
1949 ..	840	4.8	27	15,000	+ 14%	390	130
1948 ..	790	4.6	24	13,000	+ 11%	290	115
1947 ..	710	4.2	21	12,000	+ 19%	185	90
1946 ..	585	3.8	18	10,000	+100%	80	70
1945 ..	375	2.5	9	5,000	—	75	90

FOURTEEN YEARS.—These figures, based on ICAO tables, show the World's scheduled air traffic trends during the post-war years (excluding the U.S.S.R. and China). As recorded in last week's issue the passenger-mile increase for 1957 was only 5% and it will be seen from this table that the cargo ton-mile increase was only 1% by comparison with 9% for 1956-57, 14% for 1955-56 and 18% for 1954-55.

going to be done. Presumably the overall traffic potentialities will be examined and possible future national and international network plans will be discussed. Something, perhaps, like the Maybury Committee's report of 1936-37 will be produced for the guidance of local authorities; they certainly need and deserve such guidance before they can be expected to take another plunge into the damping pool of airport ownership.

Meanwhile, people have been talking rather too loosely about the meaning of the Ministry's policy—with the implication that a score or so of airports may be closed if the municipalities fail to take them over. In fact, the M.T.C.A. is at present responsible for 25 airports. Nine of these are "social service" aerodromes in the North; another six (excluding Croydon) are major international or diversion airports which are not in the market, or for which there would be no bidders anyway (who could possibly be found, for instance, to own Blackbushe or Stansted?).

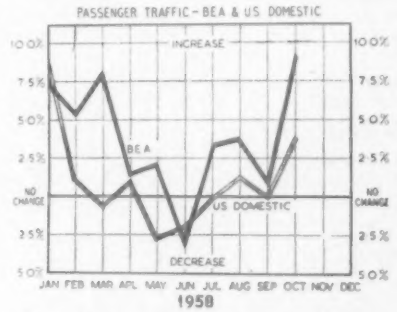
That leaves, if my arithmetic is correct, nine airports which might be taken over, partly or wholly, by local authorities. Four of these are almost or entirely essential to the U.K. airline pattern. Which leaves (nigger-boy fashion) five possible orphans of the storm of rationalization. My guess is that three of these will survive, one way or another, and that only the remaining two may eventually be closed down. There are no prizes for the identification of the possibly unlucky pair.—H.A.T.

B.E.A. Freight Success

DURING the six summer months of 1958, the revenue from freight carried by B.E.A. exceeded £1 million for the first time. A quarter of all the air freight travelling inside Europe is now carried by B.E.A., whose freight traffic is about 25% more than that of any other European airline.

The October traffic results show that B.E.A. carried over a million freight ton-miles in a month for the first time—the actual figure was 1,126,400, or 21.5% more than in October, 1957. Passenger-miles flown increased by 9.3% and load ton-miles sold were up by 11.9%. Capacity ton-miles offered were increased in October by no less than 20.8%, however, so the revenue load factor went down from 64.3% to 59.5%.

Results for November and December, although reflecting the recovery of traffic from the summer recession, will have been badly affected by the fog which has brought almost all air transport movements to a standstill on several occasions. In this connection it is worth recording that B.E.A. has now taken what Lord Douglas describes as "certain further steps towards the use" of automatic landing equipment in the D.H.121.



This graph (reproduced from the *B.E.A. Magazine*) shows the month-by-month 1958 traffic position of the Corporation compared with that of the U.S. domestic airlines.

RONGOTAI REVIVAL.—The airport for Wellington, New Zealand, which has been virtually closed since 1947, is due to come into use again in April with a 6,000-ft. runway and the latest navigational aids. Rongotai, which is the base for The de Havilland Aircraft Co. of New Zealand, was opened in 1929 as the Dominion's first municipal airport. Since 1947 Wellington's air traffic has been handled at Paraparaumu, 33 miles away.

Measuring Airline Efficiency

NEW ideas are mildly unusual in the squirrel-cage of air transport thinking. So it was pleasant to find an original approach to some of the industry's self-made problems in a paper which we had not seen until it was reproduced in the November/December issue of *Esso Air World**.

In this paper the superintendent of technical development for United Air Lines offered a theme which could produce some interesting results if the theory were to be fully and objectively applied. Using an "operational efficiency factor" he showed how compounding (and confounding) were the effects of any one (or all) of a trio of basic parameters.

The formula is inescapably simple: O.E.F.=load factor × speed efficiency × utilization factor. The load factor in the equation is straightforward; "speed efficiency" is the ratio of achieved block speed to maximum cruising speed; and the utilization factor is the ratio of achieved hours to those which are theoretically possible. For the last factor, the figure of 16 hours out of 24 is assumed to be the absolute possible maximum.

How does the little formula work out in practice? Well, it shows the desperate importance of each of the three factors. The author offers two sets of figures for a piston-engined aircraft; these give some idea of the catastrophic effects of a poor showing in any one of the three on overall efficiency.

Suppose, he says, that a DC-7 on the popular first-class schedule between Chicago and the West Coast enjoys an average load factor of 75%, a speed efficiency of 86% (a 297 m.p.h. block speed against a 345 m.p.h. maximum cruising speed) and a utilization factor of 62.5% (10 hours against the absolute optimum of 16 hours per day). The operational efficiency factor ($0.75 \times 0.86 \times 0.62$) would therefore be 0.40.

This is a fairly satisfactory operation. On shorter stages the speed efficiency would be less attractive and neither the load factor nor the utilization factor would normally be as high as those on this particular service. Over a 700-mile stage (254 m.p.h. block speed) the speed efficiency would be down to 74% and, with a load factor of 50% and a utilization factor of 43.7% (seven hours per 24), the O.E.F. would work out at a figure of 0.16.

Obviously the significance of the three variables is very much greater for the turbojet transport—an "expensive machine tool"—and much more care must be given to the business of maintaining each factor in the equation at as high a level as possible. In particular, high utilizations may be difficult to maintain and the author of the paper notes that "the current 'paper economics' of the jets have had to assume daily utilization figures essentially equivalent to current good airline practices . . . in order to arrive at encouraging economics."

Maximum Capability of Five Typical Aircraft

Aircraft type	Number of seats	Max. cruise speed (m.p.h.)	Max. daily utilization (hours)	Daily max. rev. pass.-miles (thousands)	Number of aircraft to equal DC-8 capability
DC-8	125	570	16	1,140	1.00
DC-7	58	345	16	320	3.65
DC-6B ..	58	290	16	269	4.25
CV-340 ..	44	252	16	177	6.45
DC-3	21	180	16	60	19.00

Nevertheless, he shows that, despite earlier pessimism, high utilizations are possible with turbojet transports on practical timetables for long-haul services.

The author of the paper provides a little new thinking, too, in the matter of the actual meaning of load factors. A survey showed that, to obtain an average passenger load factor of 95%, it was necessary that two services should have all seats filled for every one with some empty seats—which is a very unsatisfactory situation for the customer. With a more reasonable factor of 85% the ratio was one full aeroplane to four with a few empty seats. The remaining figures quoted from the survey were: 75% load factor means 11 aircraft with some empty seats for one aircraft with all seats filled; 65% means 32 with some empty seats; and 55% means 99 with some empty seats. Obviously, any load factor higher than, say, 75% is bad for regular business—and particularly so when the available seats over the whole of a long-haul route are limited by the bookings on a busy and important intervening sector.

* "Keeping the Jet Transports Working," by Ray D. Kelly. Society of Automotive Engineers meeting in Los Angeles, September 29-October 4, 1958.

Another Take-off Guide

IN THE AEROPLANE'S Navigation Aids and Systems number of July 25 last year we referred to the lift-measuring and "autopower" devices developed by the Safe Flight Instrument Corporation of White Plains, New York, and in the issue of December 12 (pp. 845-846) we summarized the features of several types of take-off monitors.

Safe Flight have now announced the development of a system which might be considered as a combination of the two devices, since it provides a guide (in the form of a single indicator needle) for the handling of a turbojet transport during the transition between rotation (i.e. nosewheel-lifting) speed and steady climb. It is known as the Speed Control and Take-off System (SCAT for short).

The basic principle of SCAT is that of combining the two measurements of lift and forward acceleration. The lift signal is measured by a small vane, located near the leading edge of the wing, which responds to wing-loading, angle of attack and airspeed. Acceleration is measured by a gyroscopically controlled accelerometer.

The signals from each of these two sources are added by placing them in series electrically. Thus, to keep the indicator pointer centred, the presence of a forward acceleration will demand a corresponding nose-up rotation. As this rotation decreases the acceleration, the diminishing acceleration signal will cause the needle to move unless the rotation is checked and the aircraft's attitude stabilized to maintain V_2 speed.

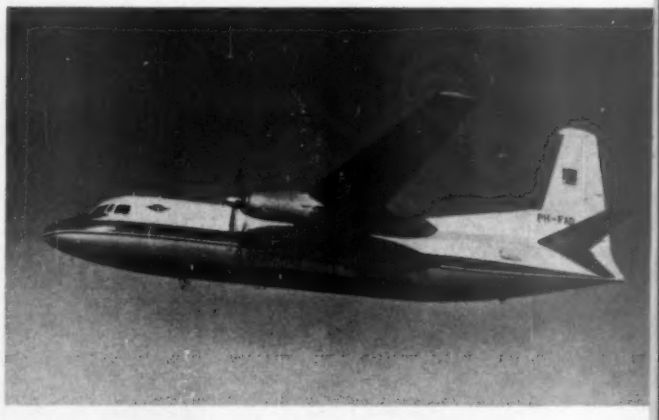
A Practical Crash Locator Beacon

A SYSTEM whereby an automatic distress beacon is safely separated from a crashed aircraft has been developed and tested by the Canadian National Research Laboratories. It is described at some length in a recently issued report.*

The beacon transmitter, which will operate for 3½ days at a temperature of −40° F., is shock-mounted in a short aerofoil section which is automatically spun away from the aircraft when released by a crash detector or collision predictor. An aerofoil is used so that drag and lift forces are developed, causing the beacon unit to curve sharply away from the aircraft and to slow down to about 20-30 m.p.h. before landing. The device would normally be attached to the tail of the aircraft.

Transmitting ranges of 5-30 miles, according to terrain, have been obtained with the prototype beacon, using normal SARAH search equipment at 9,000 ft.

* "A tumbling aerofoil radio distress beacon system for locating crashed aircraft," by H. T. Stevinson and D. Makow. Report No. MR-22, National Research Council of Canada, Ottawa 2.



This Friendship was delivered to Braathens S.A.F.E. Airtransport in Oslo on December 22, Braathens being the second European operator, after Aer Lingus, to take delivery of the type from Fokker. Braathens will use the aircraft—now re-registered LN-SUN—on domestic services.

A recent picture of the final assembly shed at Toulouse with the second to sixth production Caravelles seen in various stages of completion.

Caravelle Progress Report

AT the beginning of last month, the first prototype of the Sud-Aviation Caravelle was being subjected to vibration tests and defrosting tests, and the second prototype was undergoing overhaul at the end of 1,000 hours' flying. This latter aircraft is to be used by the Secretariat Général à l'Aviation Civile et Commerciale to give their flying staff jet experience, and will then be lent to S.A.S. for crew training.

Meanwhile, the first production Caravelle, flown on May 18, has completed C. of A. tests and is being furnished prior to being handed over to Air France. It may well, by now, be flying again. The next five production aircraft are in the final stages of assembly at Toulouse, and with the first, will be put into regular service by Air France and S.A.S. on May 15, 1959.

Four more Caravelles are in the assembly area, and fuselages up to the 21st are in various stages of construction at Toulouse. Wings are built at Bouguenais and Saint-Nazaire and other parts are subcontracted to the Sud-Aviation factories at Marignane, Rochefort and Courbevoie, and to Latécoère, Hispano-Suiza and Forges de la Boissiere.

One of the two test specimens has undergone static testing to destruction as a result of which the gross weight of the production aircraft has been increased to 99,200 lb. Water-tank fatigue tests will begin soon with the second test specimen, with an initial programme involving a series of 10,000 reversals.

BALPA'S Flight Deck Policy

DURING December the British Air Line Pilots Association issued for discussion a considered policy on the layout of two-pilot flight decks. This policy was the basis of the Flight Deck Forum, held by BALPA, which provided the background for comments in THE AEROPLANE of December 19 (pp. 883-884).

In that issue we were not able, however, to find space for some representative points in the Association's policy document. These points—which will provide a clue to the way in which BALPA's committee has been thinking—are summarized below. It should, perhaps, be stressed that the Association has concentrated, in this statement of policy, on the problems only of a two-crew layout and that the policy has been designed so that an agreed series of requirements might be offered to manufacturers. In the past it has been said that a committee of a dozen pilots usually produces 13 opinions. Here are some of the many points on which there has been general agreement.

Except for experimental purposes, it must be mandatory for all U.K.-registered aircraft of one specific type in a fleet to have the same layout locations of flight instruments and instrument details which may be used from the pilot's seat.

The flap indicator must provide positive indication of malfunctioning of flaps which could lead to an asymmetric flight condition.

Indicators must be provided on the flight deck of an aircraft which has indirect servo-tab-operated or fully powered controls, which will show the positions of the control surfaces.

Turbojet-powered aircraft must have a power or thrust indicator or power-loss indicator for each engine.

Communication and navigation equipment instruments and indicators which are not pre-selected tuned should not be mounted above the level of the pilots' shoulders.

"Attention" lights must be provided on the pilots' principal instrument panels to give warning of the failure or malfunctioning of essential systems.

When only one weather radar display console can be provided the one display head must be positioned so that it is readily accessible to either pilot when he is strapped in his seat.

The diameter and character of instrument and indicator faces must be a function of the time available for reading and of the accuracy required in the reading.

The movement of the needle or needles of an instrument must be either clockwise or rising for increasing values.

The face of an instrument should not be sunk into the case, thereby causing shadows on the indices.

A nosewheel steering wheel or tiller must be provided at both pilots' positions so that all phases of take-off and landing can be controlled from either seat.

Where there are more than two selectable flap positions a flap lever quadrant must be provided which will allow the pilots to detect, by feel, the intermediate flap positions.

When the undercarriage selection is made by lever the lever must be to one common shape so that it can be readily distinguished by feel.

The flap selection of all aircraft must be by means of a lever which must be to one common shape so that it can be readily distinguished by feel.

Those engine controls which are essential during an engine failure or other emergency must be placed in a fore-and-aft row so that the vital engine action, in order from forward to aft or from the top downwards of vertical panels, is in the order of operation as laid down in the Flight Manual.

The control and indicator panels for the principal aircraft systems must be arranged to show in a logical manner the relationship between the principal parts of each system and the relationship and correct functioning of the controls of each system.

The movement of control wheels, levers, switches and knobs must be clockwise, forward or upwards for increasing values of the output.

When the lighting systems are being evaluated consideration must be given to the adequacy of systems when the aircraft is flying into the sun or is flying at high altitude.

The ratio of toilets to the number of persons on board an aircraft must be made a mandatory requirement and be included in the Air Navigation Regulations.

A let-down chart holder must be provided at each pilot's position. The holder must not obstruct the view of any of the instruments or controls used during the let-down, approach and overshoot phases of a flight. A light must be provided which will illuminate the face of the let-down chart holder.

The frames bounding the pilot's fields of view forward through his principal window must be so arranged that he is provided with rectangular frames of reference to assist him during approach and landing.

Designers must be urged to develop an alternative to the mechanical windscreen wiper.

The existing BCAR mandatory requirement for a direct-vision window must be amended so that it is limited to those aircraft on which it can be used.

Aviation in Dutch New Guinea

A De Kroonduif Beaver undergoing maintenance at the seaplane base at Biak.

A CORRESPONDENT in Hollandia, Dutch New Guinea, has written to tell us something of aviation activities in a part of the World which is not often in the news. Some extracts from his letter are printed hereafter, together with some photographs:—

"Our local airline De Kroonduif ("Crowned Pigeon") operates Dakotas, Twin Pioneers and Beavers. The Dakotas fly regular services from Biak—the home base—to major cities such as Sorong, Hollandia, Manokwari and Merauke. They are used for aerial photo-mapping and supply dropping too. The Twin Pioneers are in use to connect the smaller towns, which have only small grass landing strips, muddy in the rain and dusty the rest of the time. The Beavers, mostly used with detachable floats, make a good job of transporting passengers and cargo to and from remote outposts deep in the jungle—as far as Enarotali on the Wissel Lakes in the Central Highlands.

The largest airfield in Dutch New Guinea is Mokmer Airport, Biak. This picture shows the control tower and entrance to the terminal building.

"The biggest airfield in D.N.G. is Mokmér Airport, Biak, which was built out of a World War II bomber base. It handles regular services for K.L.M. Super Constellations on their weekly Amsterdam-Sydney flights. Also weekly visitors are K.L.M. DC-7Cs on their Amsterdam-Tokyo-Biak run across the North Pole. Being the only airport in D.N.G. which can handle big aircraft it is used also by some foreign airlines on irregular flights to and from S.E. Asia, Australia and the Pacific Islands.

"Aircraft seen there in the past are, for example, a York of Skyways of London, a DC-7 of Transports Aeriens Intercontinentaux, an Ambassador, a Qantas Constellation, a Globemaster of the U.S.A.F. and Privateer patrol bombers of the French Navy. Last month (November, 1958) came the R.A.A.F. with Avon-Sabres, Canberras, Neptunes and Dakotas on their transfer flight from Williamtown, N.S.W., to Butterworth, Malaya (see THE AEROPLANE, September 19, 1958). The Sabres and Canberras were the first jet aircraft seen in this country. The Royal Netherlands Navy uses the nearby Boroekoe Airstrip as a base for their Martin Mariner amphibians and Firefly fighter-bombers.

"Sentani Airstrip (Hollandia) is the home base for some Cessna 180s of the Missionary Aviation Fellowship, which organization serves missionary posts all over the country. Sentani is also used by Qantas Dakotas on their weekly Lae-Hollandia flights, and by some charter airlines.

"Jeffman Airstrip (Sorong), which is built on a small island off the coast, is the home for the Grumman Mallard amphibians of the N.N.G.P.M. oil company. It is also used by Bell 47 and Sikorsky S-58 helicopters of World Wide Helicopters, Ltd., which company is on an oil survey contract with N.N.G.P.M."

One of the De Kroonduif Twin Pioneers at Sentani Airstrip, Hollandia.

Above, a DC-3 of Mandated Airlines from Lae, New Guinea, photographed at Sentani.

Left, another typical airstrip in Dutch New Guinea is at Rendani, Manokwari—with a De Kroonduif DC-3 embarking passengers and freight.

Jet Provost

The standard primary/basic trainer for the Royal Air Force

An intensive and thorough evaluation carried out with Mk.1 aircraft has paved the way to the current production version, the Mk.3. Refinements include hydraulically operated services, Martin-Baker ejection seats, wing-tip auxiliary fuel tanks and a one-piece moulded windscreen.

All Jet Provosts are powered by the Armstrong Siddeley Viper turbojet.

"The Aeroplane" photo

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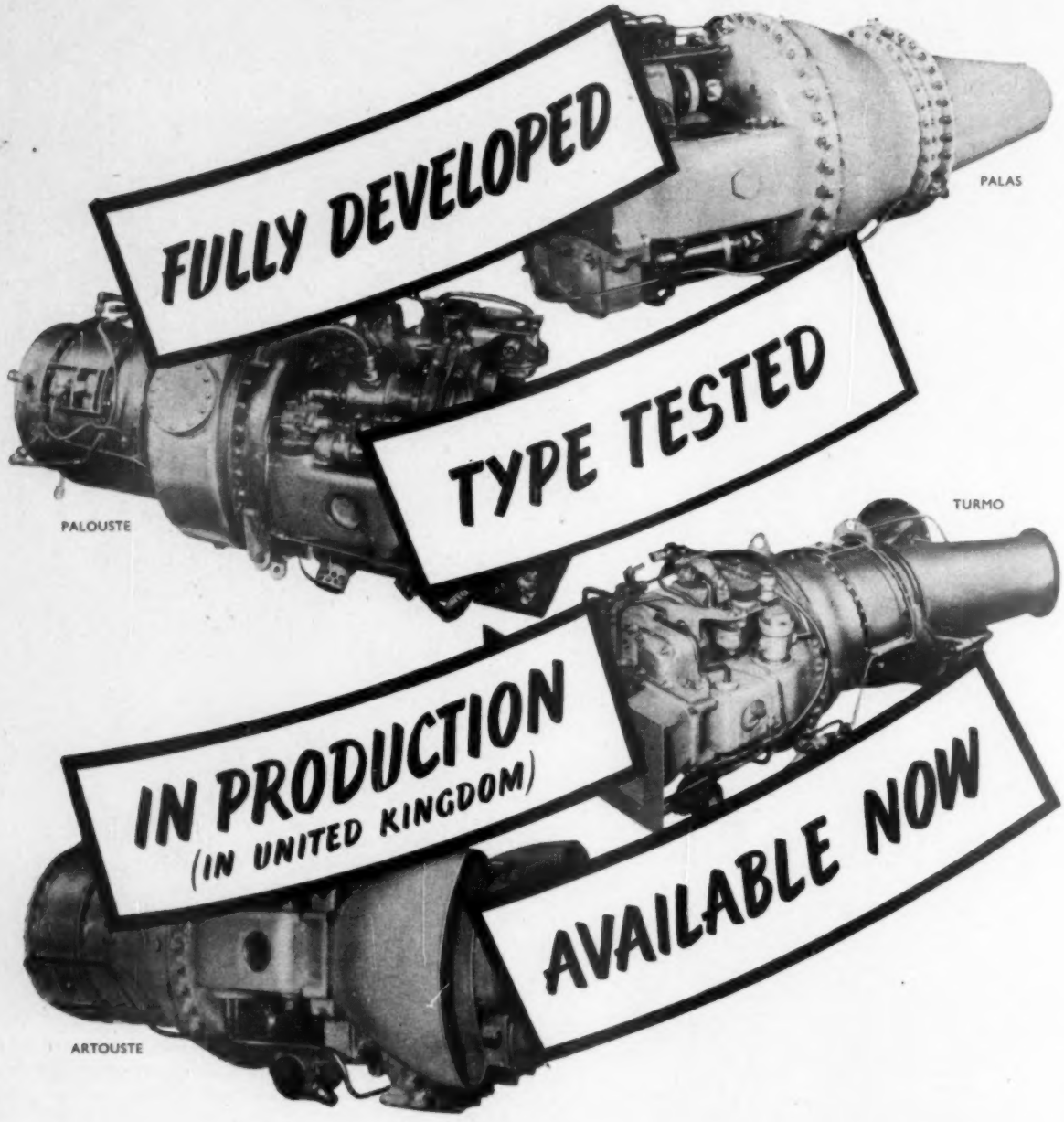

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A Venture into the "Ulu"

by
John Fricker

Photograph copyright "The Aeroplane"

LOOKING back over a year with perhaps more than its normal share of flying variety, a single day stands out in vivid recollection for the unique, if slightly horrific, experiences it provided. It was a striking demonstration of air power, without supersonics or spectacular armament. Instead, the slowest aircraft of the R.A.F. showed their mastery over topography, climate and jungle in Malaya, and the means by which terrorism has been beaten in the Federation.

Air supply and communication into previously inaccessible areas, of which Malaya is largely compounded, are mostly the key to this slow victory. Ground patrols in the jungle are almost entirely dependent on parachuted supplies of food, medical stores and ammunition from R.A.F. Valettas. Fortified posts at strategic points throughout the Federation, and manned by troops or police, each have an airstrip for STOL aircraft and helicopters, undertaking personnel and supply movements. And in cases of emergency a small clearing can be prepared by blowing down a few trees to allow the smaller helicopters to land almost anywhere in the heart of the jungle.

Headquarters of the R.A.F. transport element in Malaya is at Kuala Lumpur (Gp. Capt. P. E. Warcup, O.B.E.), which was the departure point for our venture into the *ulu*—the popular, if slightly inaccurate, Service term for the jungle. The word occurs in a number of Malayan place-names, and, according to Spencer Chapman, means "interior," in the sense of farther into the jungle.

Our introduction to jungle flying was gentle. A few minutes away from K-L, and near the famous Batu caves, is a helicopter training clearing. It is fairly representative of the average jungle clearing, with its area little bigger than the rotor diameter and, except for one end, being entirely surrounded by the 200-ft. Malayan trees. This piece of jungle is known as Ulu Langat.

Although relatively close to the Federation capital, the clearing must be secured by Malayan troops against possible terrorist intrusion, when used for training. On the day before our full-scale operation, a Whirlwind set off from K-L to drop our bodyguard into Ulu Langat, and we followed in a Bristol Sycamore of No. 194 Squadron, flown by Flt. Lt. Clarke. The Sycamores are generally used for operations into clearings, as their better power margin gives them the performance necessary for the vertical descents and ascents from 200-300 ft. in tropical and high-altitude conditions.

From the air, at first sight, it did not seem possible that the small patch scarcely visible in the luxuriant foliage could accept us. As the fluorescent red strip marking the landing platform slid slowly into view in the Perspex floor panels, however, and the Sycamore gently dropped at almost zero forward speed, the wall of trees appeared to separate as it rose around us. Its proximity demanded a highly accurate descent path, despite the bouncing rotor wash, which flattened the waving green jungle floor.

Straddling the fluorescent strip the Sycamore bumped to a standstill on the uneven ground. After a moment the pilot lifted it off again. With renewed concentration, he gingerly started a 180° turn to escape by the least forbidding route. The impassive Malay soldiers moved back to dodge the flailing rotors, and then suddenly we were free, soaring up past trailing bamboo and the whitened masts of trees, bursting through the jungle canopy into welcome tropical sunlight.

In the cool dawn next morning, photographer George Moore and myself put on our borrowed jungle-green overalls, drew our survival packs, and set off for the eventful day's operations. These started with four Westland Whirlwinds of No. 155 Squadron, which were to fly up into the Cameron Highlands to pick up troops, and relieve an army post guarding a remote aboriginal village. It was still not fully light when we lifted off in a loose stream, yellow-blue flames flickering from our exhausts, and climbed towards the cloud-capped Camerons.

Sitting alongside my pilot, Flt. Lt. Joe Hubicka, it was cold in the airy cockpit of the Whirlwind, and a refuelling stop (by cans) at the police post of Bidor provided a welcome break after an hour. As we continued, with a climb to 5,000 ft. to clear the jungle-clad slopes, a winding road running through a valley was followed to a cluster of tea plantations.

A football pitch in the nearby village of Tanah Rata, 4,400 ft. above sea level, provided a convenient base for the trooping operation. Each helicopter quickly picked up two or three Malay soldiers, and took off for the 20-min. trip to the army post. As we flapped along over featureless mountain jungle, with the rotor blades trailing brief curves of vapour in the humid early-morning air, I reflected that this same journey would take perhaps four or five days on the ground, if it could be done at all.

The picturesque Sakai village of Prolack—one of many which have been relocated with adjacent army posts for protection from terrorists—has two helicopter landing platforms. There are good approaches in the clearing by the river, and the Whirlwinds are on the ground for only a few seconds. The incoming and outgoing troops quickly change places, and the helicopters are off on the return trip of the shuttle.

After returning to Tanah Rata we transferred to a Sycamore to fly up to Ipoh, in N. Malaya. The next stage of operations was to fly in a Pioneer of No. 267 Squadron into some of the tiny airstrips alongside jungle forts. Because of the high temperature and altitude conditions in Malaya there is surprisingly little difference between the low-speed performances of the Pioneers and the helicopters when carrying full loads. Operating costs of the fixed-wing aircraft, however, are about half those of the Sycamore, and one-third of the Whirlwind's.

As we headed back towards the mountains, our faith was pinned jointly on the pilot, Flt. Lt. Charles Taylor, and the single Alvis Leonides engine of the Pioneer. The first landing was scheduled on a strip alongside a small police post at Fort Legap. From overhead, it did not look too bad, although depressingly short. It was apparent that one end of the strip was ended rather abruptly by a hill, but the other appeared to have a reasonable approach over a small river.

No tiresome indecision about which runway direction to use was therefore possible, but in its sheltered position, the strip was not particularly bothered with sizeable wind components. Just how sheltered is Legap became apparent when we reached

Right, a Westland Whirlwind H.R.4 of No. 155 Squadron en route to a remote aboriginal village in the Cameron Highlands of Malaya in the course of a troop lifting operation.

Left, Malayan troops guard this helicopter training clearing at Ulu Langat, where a Bristol Sycamore is landing.

Right, a Prestwick Pioneer C.C.1 of No. 267 Squadron photographed while returning from Ipoh to Kuala Lumpur after the flight described below.

the "downwind" leg of the circuit, to find that there is a ridge of hills which effectively prevents any part of the landing area from being seen until turning on finals.

There are then just 178 short yards of turf before the young mountain at the end of the runway. Overshoots are therefore impracticable, and, to get in at all, it is necessary to hug the treetops all the way round the blind circuit.

This Flt. Lt. Taylor proceeded to do, not, unfortunately, without some difficulty, because of severe turbulence from the trees. Tossing around in the updraughts, it was necessary to throttle right back for most of the time, anticipating sudden sinks with bursts of engine. In horrid proximity outside our small cabin, the dead-looking branches of the tall trees clutched at our wings as, with flaps and slats extended, we staggered nose-high round the jungle corners.

One found time to reflect on Flt. Lt. Taylor's intimacy with

Left, a Whirlwind pilot's view Sakai

Right, first view of the 178 yd. is on the final approach,

Photographs

Above, in trooping sorties such only a few minute

these botanical back streets while wondering at the same time if the engine was going to respond to the next crucial burst of power. Over the pilot's shoulder I could see the stick being thrashed from side to side through the extremes of its travel to keep the wings more or less level, and the intermittent application of engine served to keep us just clear of the clutching trees as our speed swung wildly between 30 and 60 knots.

There was obviously no room for excess airspeed on that apparently suicidal strip, but, in those conditions, a stall would probably be equally undesirable. When we finally turned the last corner, and saw the hill immediately in front of us, it was easy to overlook the strip altogether, except for the presence of the asbestos-masked and -gloved soldiers making up a fire party, who stood awaiting our arrival at the blank end.

We seemed impossibly high as we lurched into the clear over the river, but Flt. Lt. Taylor took off power, and the Pioneer sank like a parachute, with about 25 knots on the clock. We contacted the ground in no uncertain manner and ran only a few yards before coming to a gently braked stop. It was then necessary to taxi along the few remaining yards to the end and turn round in readiness for the take-off, after refuelling by hand.

Our pilot allowed that it might have been rather more turbulent than usual, as we stepped with relief from the aircraft. He decided, in fact, that it was inadvisable to take off for some time because of the difficult conditions (departure from this strip is almost as marginal as the arrival), and we were not able to leave for over three hours.

When we finally climbed clear through the same circuit, we spent a further interesting half-hour threading our way through jungle valleys in and out of cloud, in an abortive attempt to reach the other forts on our schedule. The Cameron Highlands had their frequent afternoon blanket of cloud, which closed every tortuous route we tried.

Sometimes we had to slow right down, with flaps and slats extended, to turn at the blind end of a valley, and we gained an all-too-clear idea of the remarkable standards of flying required by these operations. The most impressive thing to remember, however, is that they are not isolated undertakings. They are performed not only daily but several times each day by these highly skilled pilots.

Below, a view from the police post of the strip at Fort Legap, with the Pioneer turned round ready for take-off.

he helicopter landing platforms at the ge of Prolack.

way for the Pioneer pilot at Fort Legap nown here. Overshooting is out.

ight "The Aeroplane"

he one to Prolack the Whirlwinds spend the ground between lifts.

The Fighting Services

Transport Command Britannias

LAST week the first of the 20 Britannia 253s ordered by the Ministry of Supply for Transport Command made its maiden flight from the Belfast airfield of Short Brothers and Harland. Fifteeen of the total number ordered are being built at Belfast, and the components for the remaining five Britannias, which are to be assembled at Bristol, are also being manufactured by Shorts.

The Service is expected to receive a number of its new transports by the middle of next year and the first Britannia squadron will be No. 99, at present based at R.A.F. Lyneham and operating Hastings. No. 99 Squadron will remain at Lyneham when it is re-equipped and at least one more Britannia squadron is to be formed. Working on an aircraft establishment of eight, the formation of more than two squadrons will necessitate the ordering of a further batch of Britannias in the near future.

Designed to be operated as a troop-carrier, freighter or air ambulance, or a combination of these three rôles, the 253 is known by the R.A.F. as the Britannia C.1. Its still-air range with maximum payload (34,000 lb.) is 4,310 miles at 357 m.p.h. and with maximum fuel capacity of approximately 8,500 Imp. gal. the payload is 23,372 lb., giving a still-air range of 5,310 miles at 357 m.p.h. In the troop-carrying rôle it can be fitted with 115 seats. The 253 is powered by four Bristol Proteus 255 turboprops each developing 4,445 e.h.p. and equipped with water injection for take-off.

Fighter Command Appointment

AIR COMMODORE T. U. C. SHIRLEY, C.B.E., is to become Senior Technical Staff Officer at Headquarters, Fighter Command, with the acting rank of Air Vice-Marshal, with effect from March 1, 1959. Appointed Command Signals Officer, Fighter Command, in 1953, he became Commandant of the R.A.F. Technical College, Henlow, in 1957. When he takes up his new post in March Air Cdre. Shirley will become the first former R.A.F. wireless apprentice to reach Air Vice-Marshal rank.

Badges and Mottoes

THREE more R.A.F. stations—North Coates, Hemswell and Middleton St. George—have had badges approved by H.M. The Queen. For North Coates, the Service's first Bloodhound guided-missile station, both badge and motto are designed to signify the rôle of this new Fighter Command unit. The badge, described as "in front of a ray of lightning in bend a Ballista," is a direct link with the Bloodhound, the ballista, an ancient weapon of bombardment, underlining North Coates' association with defensive and offensive weapons. The flash of lightning symbolizes the radar equipment which tracks the targets and guides the missiles to them. The motto is "Guide to attack."

Hemswell, a Bomber Command unit, has for its badge "an Ermine salient," and the motto "Bold and Tenacious." For Fighter Command's Middleton St. George, the badge takes the form of "a Canada Goose displayed holding the blade of an ancient Sword pommel and hilt to the sinister." The motto is "Shield and Deter." The Canada goose is a reminder of the wartime association with the station of No. 6 (Bomber) Group, R.C.A.F.

The first Transport Command Britannia 253 taking off on its maiden flight from the Short Brothers and Harland airfield at Belfast on December 29. As recorded on this page, No. 99 Squadron at R.A.F. Lyneham will be the first Britannia squadron.

Fleet Air Arm Promotions

INCLUDED in the half-yearly list of provisional Naval promotions to date from June 30, 1959, are the following Fleet Air Arm officers and officers serving in aircraft carriers or Air establishments.

Commander I. S. McIntosh, D.S.O., M.B.E., D.S.C., of "President" and late executive officer, "Ark Royal"; Cdr. P. L. Langly-Smith, executive officer, "Eagle"; Cdr. W. C. Simpson, O.B.E., D.S.C., of "Walkerton" and formerly on the staff of F.O.A.C.; Cdr. W. B. S. Milln, of "Victorious"; Cdr. G. A. Hewett, D.S.C., of "Ark Royal," and Cdr. D. F. Butlin, Department of Director General Aircraft, are to be promoted to the rank of captain.

Lieutenant Commander L. D. Urry, of the Air Warfare Division; Lieut. Cdr. D. W. Foster, direction officer, "Eagle"; Lieut. Cdr. H. J. Abraham, Lieut. Cdr. (Flying), "Eagle"; Lieut. Cdr. R. C. Fisher, direction officer, "Victorious"; Lieut. Cdr. I. H. F. Martin, D.S.C., of "Daedalus"; Lieut. Cdr. F. Bromilow, C.O. No. 849 Squadron; Lieut Cdr. D. B. Morison, First Lieutenant "Britannia," late C.O. No. 898 Squadron; Lieut. Cdr. I. S. S. Mackay, navigating officer, "Albion"; Lieut. Cdr. J. M. Forbes, of the Air Warfare Division; Lieut. Cdr. R. L. Garnons-Williams, gunnery officer, "Eagle"; Lieut. Cdr. W. H. Cowling, C.O. No. 989 Squadron; Lieut. Cdr. D. L. G. James, C.O. No. 719 Sq.; Lieut. Cdr. C. A. Brown, of the Naval Air Maintenance Development Unit; Lieut. Cdr. K. B. Birkett, of R.A.E. Farnborough, and Lieut. Cdr. M. Roberson of the Department of Director General Aircraft, are to be promoted to the rank of commander.

AIR SUPPORT.—At the start of last month Maj.-Gen. K. Darling, Director of Operations, Cyprus, stated that air reinforcements in the form of Whirlwinds, Chipmunks and Pioneers were being flown out to complete an "air umbrella." Here Chipmunks of No. 114 Squadron are seen flying over the island after being flown out from the U.K. in Blackburn Beverleys of Transport Command.

F.A.A. Flying Training

WITH the introduction of new aircraft types into service and other developments taking place in the Royal Navy, the training of Fleet Air Arm personnel, and of the new and disembarked front-line squadrons, within the framework of Home Air Command is undergoing a number of changes.

National Service aircrew training in the Fleet Air Arm ended in January, 1957, and all pilots and observers are now drawn from two sources. From the General List come permanent officers from the Fleet or the Britannia Naval College, while Supplementary List personnel are recruited direct from civilian life or selected from volunteer ratings. Pilots and observers on the Supplementary List receive a basic course of 12 weeks on general Naval training at Manedon before starting their respective aircrew instruction.

Basic and advanced flying training up to wings standard is provided by the R.A.F. for all Fleet Air Arm pilots at No. 1 Flying Training School at Linton-on-Ouse. There, *ab initio* pilots receive 120 hours' instruction on Provosts (60 hr. dual and 60 hr. solo) which is followed by 110 hr. dual and solo flying on Vampire T.11s and 5s.

On the results of their training at No. 1 F.T.S. students are divided into potential day or all-weather fighter pilots and transferred to the Naval Air Fighter and Strike School at R.N.A.S. Lossiemouth. At Lossiemouth two squadrons—Nos. 736 and 738—undertake the operational conversion and armament courses which last for 21 weeks, providing 100 hr. for day fighter pilots on Sea Hawks or 105 hr. for all-weather pilots on Sea Venom FAW.21s.

Under the training scheme at present in operation Sea Hawk pilots go first to No. 736 Squadron for 50 hr. instruction which includes conversion to type, close and tactical formation flying, and camera gunnery. They also complete a number of day-and-night navigation exercises and learn the basis of tactical reconnaissance and Army support before transferring to No. 738 Squadron for armament training.

Pilots for all-weather operation go direct to No. 738 Squadron from Linton-on-Ouse, where they complete both sections of the course flying the Sea Venom FAW.21s solo. Taking a similar syllabus to the Sea Hawk pilots, they complete the same armament programme except for dive bombing.

While at the Naval Air Fighter and Strike School student pilots attend Ground School where they complete, in conjunction with the flying training, a syllabus designed to give them a thorough knowledge of their aircraft and its tactical uses. Subjects covered include air traffic control, meteorology, high-speed flight, high-level navigation, engineering, communications, armament and Army support.

Under the present scheme student pilots are also posted from Linton-on-Ouse on completion of their wings training to R.N.A.S. Lee-on-Solent for helicopter conversion. At Lee-on-Solent they receive 20 hr. on Hillers and 30 hr. on Whirlwind 1s and 3s with No. 705 Squadron.

For future helicopter requirements it is proposed that students should transfer from No. 1 F.T.S. at the end of the Provost stage to No. 705 Squadron, which is planned to move to R.N.A.S. Culdrose later this month. Under this scheme the helicopter course will last for 14 weeks and include 20 hr. on Hillers and 55 hr. on Whirlwinds. At the end of the course students will receive their wings in the normal way.

From Culdrose, pilots will go to "Vernon" and "Osprey" for three weeks of tactical doctrination before being posted to No. 719 Squadron, the Naval Anti-submarine Operational Flying School. The school is at present based at R.N.A.S. Eglinton but is due to move to Portland this year. Providing complete crew training and work-up, it operates a 14-week course which includes 70 hr. flying on Whirlwinds. From Portland crews will be posted to the front-line anti-submarine squadrons.

All-weather pilots go from Lossiemouth to the All-weather Fighter School (No. 766 Squadron) at R.N.A.S. Yeovilton to join up with an observer and complete their crew training. This starts on an AI procedure trainer, and a large proportion of the exercises are practised on the ground before being repeated in the air in Sea Venom FAW.21s. The syllabus covers aircraft familiarization and navigation exercises, AI instruction, and finishes with tactical training.

Altogether, crews complete 110 hr. in the air, of which one-third is at night, and approximately 30 hr. in the AI trainer. All AI flying exercises are done in pairs, and pilots have to complete 25 day landings on type before they start night flying. At the end of the advanced training period, which takes 14 weeks, crews are posted to front-line squadrons.

In addition to these courses, conversion on to Scimitars for new pilots coming through the "pipe-line" will take six weeks and 50 hr. flying, and Sea Vixen conversion is planned to take a similar period.

Observer Training

As in the case of pilots, entrants for observer training are drawn mostly from the Supplementary List, the remainder being Dartmouth-trained regular officers from the General List, and after the common preliminary training, they arrive at Culdrose for the basic observer's course. This involves 75 hr. flying in Sea Princes during 17½ weeks on radar and navigational exercises, and is soon to be undertaken in Malta, where the Observer Training School is moving from Culdrose, to take advantage of better weather for training.

Pupil observers have already undergone high-altitude selection tests before reaching O.T.S., and on their suitability depends whether they go to an airborne early warning, all-weather fighter or anti-submarine operational flying school for the next stage of training. Trainees for anti-submarine crews, as in the case of pilots, go first to "Vernon" and "Osprey" to learn the tactical doctrine, before transferring to the A.S./O.F.S. at Eglinton, where 70 hr. are flown in Whirlwinds in the course of 14 weeks, to wings stage.

Observers for all-weather fighters (FAW) have an initial familiarization course on high-speed navigation, radar instruction, etc., of 30 hr. in seven weeks on Sea Venoms, before completing 70 hr. crew training in a further 14 weeks on the same aircraft. After the award of their brevets all-weather fighter observers will stay another six weeks at Yeovilton to convert to the Sea Vixen, and complete another 50 hr. flying.

Advanced training for AEW observers is undertaken by No. 849 Squadron at Culdrose, at present on AD-4W Skyraiders, but later this year on Gannet AEW.3s. Familiarization occupies 30 hr. flying in seven weeks, after which crew training requires a further 70 hr. in 14 weeks. Total flying for AEW and FAW observers to wings standards is therefore 175 hr. Another 50 hr. conversion is at present required by FAW observers for the Sea Vixen.

Supplementary List pilots and observers will stay in their specialist jobs throughout their flying careers, but General List personnel will usually do a second tour on another of the three branch duties. All observer entrants are now volunteers, although some General List officers were selected for flying on this duty in the past. Future requirements will probably include a strike O.F.S. for the Blackburn NA.39, and crews will, initially, probably be transferred from the all-weather fighter branch.

Sea Venom FAW.21s of No. 766 Squadron, the Naval All-weather Fighter School at R.N.A.S. Yeovilton. Here all-weather fighter pilots from the Naval Air Fighter and Strike School at Lossiemouth join up with observers from the Observer Training School at Culdrose to complete their crew training.

Photograph copyright "The Aeroplane"

Controlling the Flying Atar

DETAILS of the control and stabilization systems for the SNECMA Atar Volant (Flying Atar) VTOL research aircraft have not been available until now. The description below relates primarily to the C-400 P-2 (demonstrated at the 1957 Paris Air Salon) which has been used for development of the C-400 P-3 (with enclosed pilot's seat) and the C-450 Coleopter.

The Atar Volant C-400 P-2 was the first of the series to be piloted—the pilot being perched in an ejector seat over the air intake of a vertical SNECMA Atar DV turbojet of 6,393-lb. thrust. Its take-off weight was 5,730 lb. and the first flight was on April 8, 1957, when the pilot was M. Auguste Morel.

Fuel for about 10 minutes' flying is contained by annular tanks around the compressor, although most flights are of about half this period in duration.

Rudder Control and Autostabilization

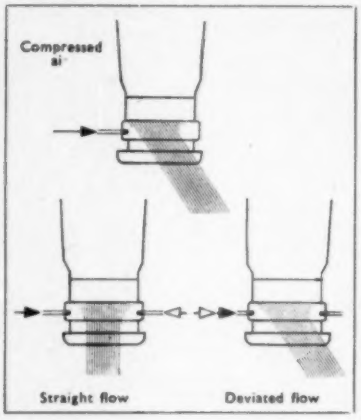
For such a VTOL aircraft as the Atar Volant the aerodynamic forces on a conventional control surface would be negligible at low speeds and no useful controlling torques would be produced. The answer to this is deflection of the engine jet efflux. Similarly, the self-stabilization of a conventional aircraft by the balance of aerodynamic moments is not available and an autostabilization system has been adopted.

The basic loads acting on the Atar Volant are its weight and the engine thrust, which are in opposition. This equilibrium is neutral and can be upset by any disturbance. Therefore stabilization requires the detection of the effects of disturbances because the direct detection of the disturbance is not possible. It is necessary to use deflection of the jet efflux to balance these effects by producing control torques.

If the weight is balanced by the thrust, then control forces are required to counteract external disturbing torques and gyroscopic torques. Since the roll axis of the aircraft is on the engine's axis of rotation, only the yaw and pitch axes are concerned with gyroscopic torques.

The two types of regulating systems which can be used for control are a position-regulating system and a speed-regulating system. The first produces a control torque and the second a control speed, both of which are proportional to the algebraic sum of the detected signals. Both systems use detectors, a motor and a power amplifier. The detectors are a gyroscope giving a vertical datum and a gyrometer measuring angular speeds during motions of rotation about an axis.

Behaviour of a unit fitted with a position-regulating system is analogous to a system consisting of a spring, a mass and a damping component. In this type of system the gyroscope has to create the adjusting torque and the gyrometer produces the damping torque.



These three diagrams show the throttling and deflection effects of air jets at right-angles to the engine exhaust efflux of the Atar Volant.

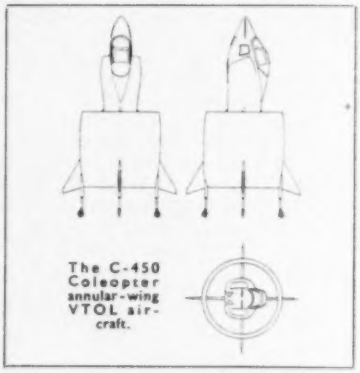
In a speed-regulating system the gyroscope has to check the angular position while the gyrometer acts as a spring to produce the adjusting torque.

A disturbance, whether a gust or inadvertently wrong trimming by the pilot, causes the two systems to react in different ways. With a position-regulating system fitted, a unit tilts when submitted to a disturbing torque. A unit fitted with a speed-regulating system recovers its vertical position from which it has moved briefly under the influence of the disturbance; it can take a permanent displacement from the vertical only at the deliberate control of the pilot. This last fact is the reason for choosing this type of regulating system for the Atar Volant.

Jet Deflection

A compressed air jet acting at right angles to the direction of the exhaust flow has the effect of deflecting the efflux and reducing its cross-sectional area.

For the Atar Volant, compressed air is bled from the engine's annular combustion chamber and taken through pipes to a valve powered by a servo jack. According to the angle of rotation of the jack, so the valve controls airflow into two symmetrical pipes feeding into the engine exhaust nozzle at right angles to the engine efflux.



The C-450 Coleopter annular-wing VTOL aircraft.

With the valve in a neutral setting there is an equal flow of air in each pipe, and the exhaust is not deflected although its cross-sectional area is reduced to the correct diameter for the required thrust.

To create a torque tilting the nozzle to one side, the valve is moved from neutral so that more air flows in one pipe than in the other. In fact, two pairs of air pipes are used at the nozzle, one pair on the yaw axis and another for pitch control.

Whether the engine exhaust efflux is deflected or not, the air pipes at the nozzle provide the means of throttling the engine and varying thrust by controlling the diameter of the efflux.

Control about the roll axis is by reaction to air bled from the engine compressor and vented at the ends of "puff pipes" positioned in opposing pairs at the ends of the struts of two of the undercarriage shock-absorbers. These controls also take care of gyroscopic precession forces induced by steering movements of the pilot.

The "puff pipes" are quite long so that a large couple about the roll axis is produced so that as little air as possible is bled from the compressor—otherwise there would be too great a loss of engine thrust. Air delivery to the pipes is regulated by electrically operated shutters directly connected to the stabilizing mechanism.

Not unexpectedly, control in the vertical plane is obtained by increasing or decreasing engine thrust and when thrust equals weight the Atar Volant hovers.

When the control column is moved the aircraft moves under the influence of the horizontal component of thrust thus provided, the vertical component having to be sufficient to sustain the weight. Therefore the throttle must be opened as the control column is moved from neutral or the aircraft will sink.

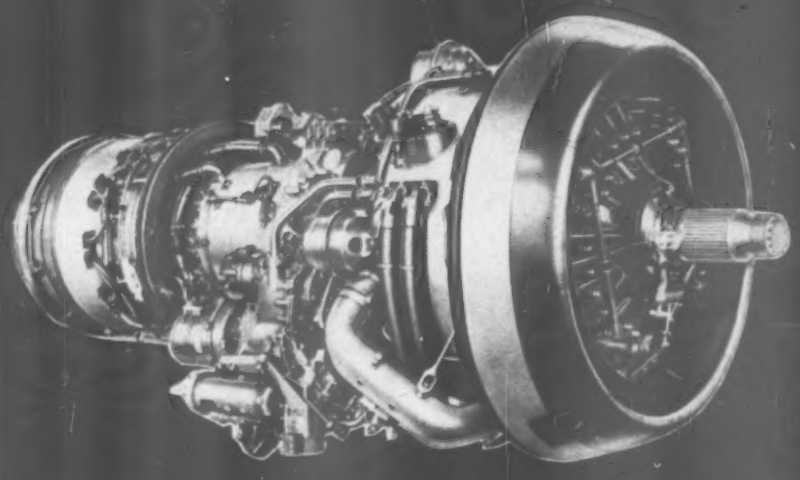
Flight testing by SNECMA with the C-400 P-1 (unpiloted) and P-2 (first piloted) Atar Volants have proved the effectiveness of the air jet controls and the autostabilization system.

The first of the series to have improved servo-mechanism performance for "fail-safe" dependability was the C-400 P-3 with enclosed cockpit and side air intakes. This is being developed further for the C-450 Coleopter annular-wing subsonic VTOL research aeroplane.—D.G.

The SNECMA C-400 P-2 was the first piloted Atar Volant of the series of experimental VTOL aircraft.

ROLLS-ROYCE

TYNE PROP-JETS



The Tyne is an advanced twin spool high compression engine in the 5,000-6,000 h.p. class and has been designed to give a very low specific fuel consumption. It is backed by the unique experience gained by Rolls-Royce in more than 6,000,000 hours operation of gas turbine engines in scheduled airline service at overhaul lives of up to 2,200 hours which have been achieved on Rolls-Royce Dart engines. The Tyne will power the Vickers Vanguards ordered by British European Airways and Trans-Canada Air Lines and the Canadair CL-44D long range transport developed from the Bristol Britannia for Canadian requirements.

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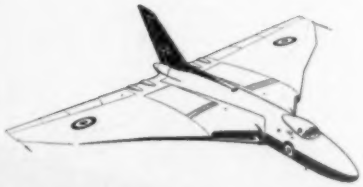

No. 3 in a series of paintings by Keith Shackleton S.Av.A. presented by Cellon Limited

Pintails in the Snow

The picture shows two drake pintails, one of the most beautiful and fastest-flying of the waterfowl. It is a bird which is common in Britain and breeds here, though its range extends all across Europe, Asia and North America.

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Rotorwing Amateurs

SEVERAL Bensen rotorcraft are being built in this country and their construction raises some interesting points regarding the flying of them.

In the U.S.A., Igor Bensen has developed powered and engineless versions of the basic design. The basic B-7 single-seat Gyro-Glider is a simple unpowered aircraft for towing behind a car; the B-8W Hydro-Glider is a marine version for towing by motor boat; the B-7B Gyro-Boat consists of the rotor system

mounted on a dinghy; and the B-8M is a powered version of the B-7 with a 72-b.h.p. McCulloch flat-four engine driving a propeller at the rear.

So far C.A.A. approval has not yet been given to the Bensen, although a number of kits for its construction have been sold. The " glider " version does not present any great problem, but the powered aircraft requires a least a Permit to Fly in Great Britain.

The McCulloch engine is not yet approved in this country and it is not easily available here, although at least one has been obtained for approval.

Should C.A.A.-approval for the Bensen be given in the U.S.A., this certification could be validated by the A.R.B. Otherwise, the Bensen would have to be put up for separate approval in this country.

Igor Bensen is at present operating his interesting little rotorcraft under a special dispensation for experimental aircraft. His customers—and those for kits of such types as the Briegleb BG-12A sailplane—presumably operate their aircraft in the experimental category for amateur-built aircraft under C.A.R. Pt. 1.

International Air Congress

SPONSORED by the U.S.A.F. Association, a World Congress of Flight is to be held at Las Vegas, Nevada, between April 12 and 19. Co-operating organizations are the Air Transport Association of America, the Flight Safety Foundation, the National Aeronautic Association, the National Business Aircraft Association and the Space Education Foundation.

Invitations to participate are being sent to all countries, including the Soviet Union. There will be conferences, air displays, demonstrations of airliner flying characteristics, static exhibits and a number of meetings. The programme is:—

April 12, Press briefing and preview; April 13 and 14, conferences and demonstrations of the " jet age "; April 15, military flying and firepower demonstrations, NATO day (10th anniversary programme) reception; April 16 and 17, conferences and displays on missiles and space; April 17, banquet; April 18 and 19, exhibits and displays open to the public.

Features of the congress are a large auditorium for conferences, an exhibition hall, aerial displays and demonstrations at McCarran Field, a stadium and Nellis A.F.B. Gunnery Range. Information centres will be staffed by specialists from the U.S.A.F. Air Materiel Command, the Air Research and Development Command and the newly formed Federal Aviation Agency.

From North of the Border

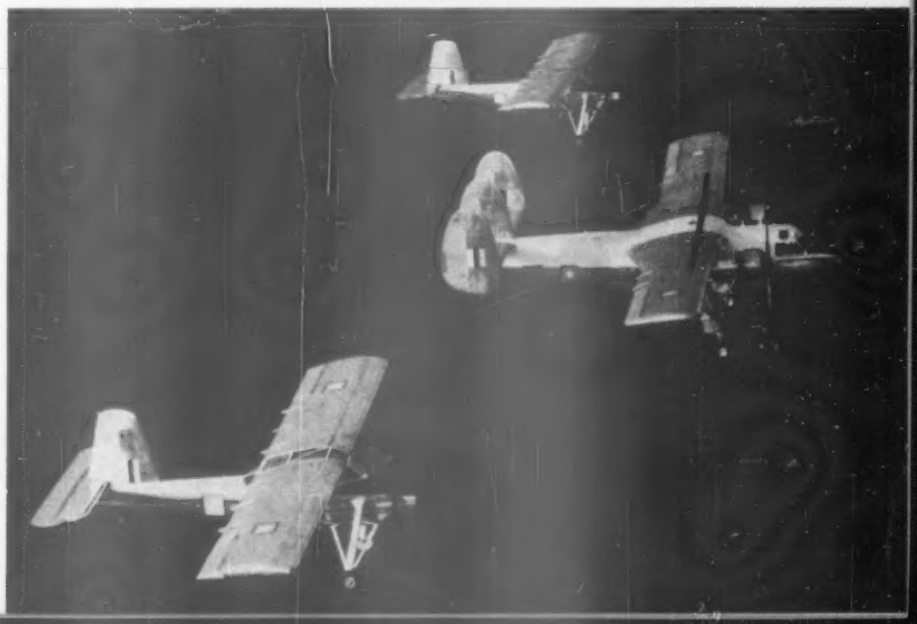
SINCE the first Twin Pioneer was delivered to Malaya in April, 1958, as the first aircraft of the embryo Royal Malayan Air Force, the Federation Government has placed an order for three more Twin Pioneers and four Prestwick Pioneers. At a ceremony held in the Scottish Aviation factory at Prestwick on December 29, Tunku Ya'acob, High Commissioner for the Federation of Malaya, formally accepted the first Twin Pioneer and two Prestwick Pioneers of this follow-up order. They were handed over by the Duke of Hamilton, chairman of Scottish Aviation.

In handing over the three aircraft the Duke said that Scottish Aviation felt that there was a great demand for its products in all parts of the World where high speed and payload were not the first requisites.

Replying, Tunku Ya'acob said his prediction that the Twin Pioneer, because of its short take-off and manœuvrability, would suit Malayan conditions, had proved correct. Because it suited the available airstrips and because it was cheap to operate, this aircraft, he said, had come to stay in Malaya. He hoped this order would be followed by many more so long as they had the money.

The aircraft are to be used on jungle operations and to provide communications in parts of the country where other transport is difficult. They will also fly alongside the R.A.F. in operations to clear terrorists from the jungle and to reinforce the jungle forces set up for the protection of the civilian population.

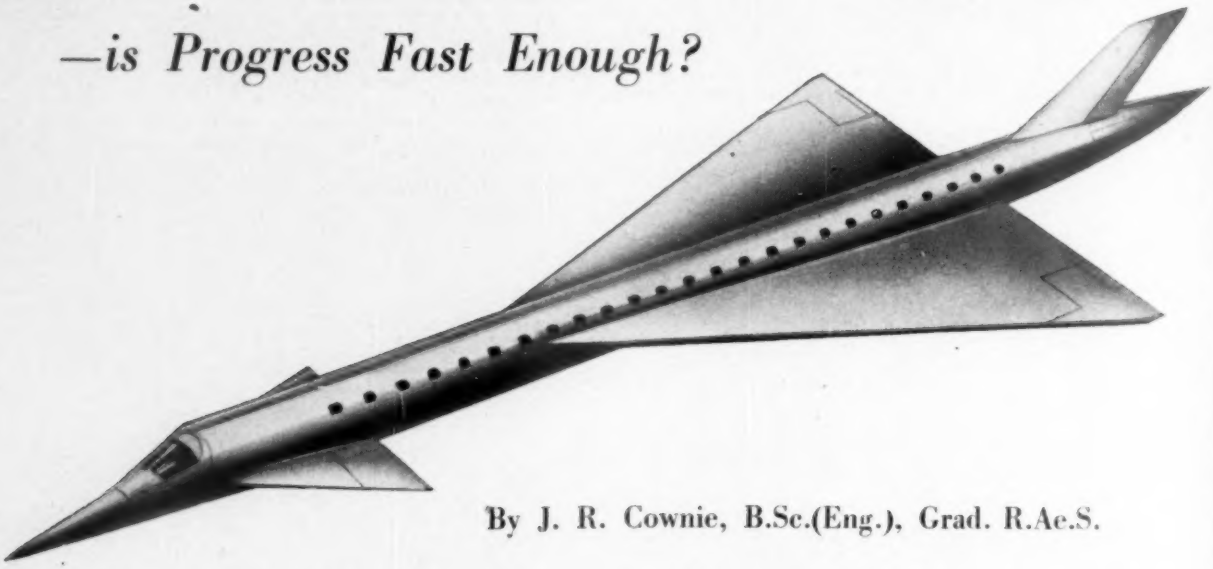
For R.A.F. work in Malaya see pp. 41-43.



EASTWARD BOUND.—A Twin Pioneer and two Prestwick Pioneers (Alvis Leonides powered) which were handed over to the Royal Malayan Air Force recently. These aircraft, which are being flown out by stages, bear the air force insignia consisting of a yellow multi-pointed star on a light blue square outlined in dark blue.

BRITAIN'S SUPERSONIC AIRLINER

—*is Progress Fast Enough?*



By J. R. Cownie, B.Sc.(Eng.), Grad. R.Ae.S.

NEARLY two years ago the formation of the S.T.A.C., or Supersonic Transport Aircraft Committee, was announced by the Ministry of Supply. This committee, which was set up to study the problems and possibilities of building a British supersonic airliner, has not yet made its report. Associated in these studies are the Royal Aircraft Establishment, the airline corporations, and most of the major British aircraft companies.

No news of progress has been given in the two long years since this committee began its work. Every so often questions about it are asked in Parliament, but the answers are usually non-committal; they imply that no rapid progress or results are to be expected. In June the Parliamentary Secretary to the M.o.S. said that the main problem was to decide whether a supersonic airliner could be economic. An answer was then expected " in about 12 to 18 months." If favourable, it would " be a matter for arrangement with suitably powerful groups manufacturing airframes and engines to produce a practicable design and it will be at that point that the question of Government assistance will arise."

In November the Minister of Supply said that the final report of the research study was not expected to be available for some time. He went on to say, " I think it is important first to determine what the most economic shape of a supersonic airliner is likely to be. At this stage I would attach greater importance to obtaining clarity of perception rather than plunging into execution."

His words give cold comfort to those who hope that Britain will produce a supersonic airliner ahead of her rivals. It is known that in the United States Boeing, Douglas and Lockheed all have active supersonic studies both for military tankers and civil airliners. Possibly more important, Mach-3 military aircraft are under development by North American. These are the B-70 Valkyrie bomber and the F-108 long-range interceptor. There is also active military research on flight at even higher speeds; one prominent project is the Dyna-Soar boost-glide bomber. All the research associated with these projects will help the development of supersonic airliners.

Another potential rival to Britain is Russia, whose new Bounder supersonic bomber is reported to be in squadron service. If Russia does in fact have a Mach-2 bomber in squadron service that country's ability to produce a supersonic airliner cannot be doubted.

Alternative Choices

The S.T.A.C. has a wide field to survey and it is perhaps not surprising that its work has not been completed in two years. It is interesting to examine briefly some of the problems of the supersonic transport and the range of operating speeds rumoured to be under study.

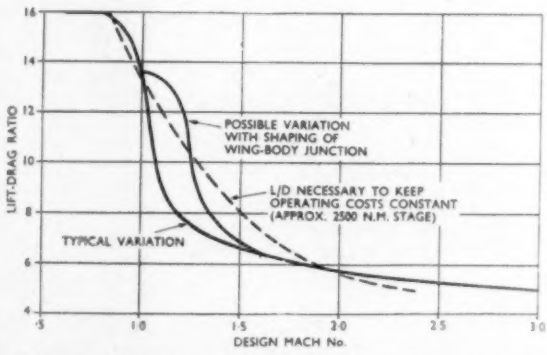
Operating costs are the basis of the problem. Four factors which affect both the economics and range of a transport aircraft are its lift-to-drag (or L/D) ratio, the specific fuel consumption of its engines, its cruising speed and its ratio of empty to laden weight. Over the years these factors have so been varied that there has been a steady reduction in the operating cost of subsonic airliners together with an increase in their cruising speed.

The main difficulty with supersonic aircraft is that wave drag reduces the L/D ratio to about five or six compared with a value of about 18 to 20 for subsonic airliners. As a result, much more power is needed for cruising flight and this has a very bad effect on economy and range. One of the main problems in designing a supersonic airliner is the choice of the configuration with the best L/D ratio.

An increase in cruising speed improves operating costs, but to some extent this improvement is counteracted by higher engine specific fuel consumption. The cruising speed divided by specific consumption gives a measure of engine thermal efficiency; this increases at supersonic speed and helps to offset the adverse effects of the reduction in L/D ratio, as the graph below demonstrates. At high speeds the turbojet can be more efficient than modern diesel engines or steam power stations.

Another factor which works in favour of the supersonic airliner is the relatively low weight of its wing. The highly swept delta, with the leading edge swept inside the Mach cone, appears to have the best supersonic L/D ratio. Even though a low-aspect-ratio wing of this type must be thin, its structure weight is relatively less than for the wing of a subsonic airliner.

In theory, the development of a supersonic airliner should be worth while if its operating costs are similar to those of current



For constant operating costs the L/D ratio can fall considerably as Mach number increases. The graph also shows how the drop in L/D ratio can be deferred at low supersonic speeds by suitable wing-body shaping.

aircraft. But there are many difficulties in estimating these costs and much depends on the assumptions made. To mention just one, the initial cost of an aircraft influences its operating costs. But what production run should be assumed in estimating the capital cost of a supersonic airliner? Will 50 be built—or 20, or 100? Individual airlines will not need many, as each aircraft will do the work of perhaps two or three current airliners. Without knowing the production run, it is impossible to assume a realistic initial cost.

Another difficulty is deciding the basis of comparison. The supersonic airliner should compare reasonably not only with the subsonic airliner of today, but also with the subsonic airliners it may rival in 10 or more years' time. By then Area-rule styling, turbofan engines, and possibly laminar-flow techniques, will have reduced current operating costs substantially.

This sketchy discussion of the operating-costs problem takes no account of the many other factors which affect the design of supersonic airliners. The low payload in relation to all-up weight, the heating, noise, fuel-stowage and engine-intake design problems, take-off and landing difficulties, operational problems and many other important aspects cannot be discussed in any detail, but a short examination of them appears below. An interesting survey of these problems is given in the current *Handley Page Bulletin* by Mr. C. F. Joy, the company's chief designer.

Design Problems

Clearly the fundamental problems in designing a supersonic transport are to ensure competitive operating costs and a reasonable range/load performance. Many of the basic requirements have a bad effect on range/load performance. Conventional take-off and landing demand a larger wing area than is necessary for efficient cruising flight. To carry a reasonable passenger load a large-diameter fuselage is needed. For supersonic flight powerful—and thus heavy, thirsty and noisy—engines are necessary.

These factors tend to limit the long-range performance of supersonic transports. In the light of present knowledge the only way of ensuring an adequate range/load performance for the supersonic transport appears to be to increase the take-off weight or to use special high-energy fuels. These fuels, however, are expensive; they are unlikely to improve the economics of supersonic airliners unless they cost less than twice as much as conventional fuels.

There are serious disadvantages in increasing the take-off weight for a given payload, as the whole design becomes more critical. As the payload becomes a smaller percentage of the all-up weight, there is a greater chance that it will disappear altogether if during development there are small increases in structure and equipment weight, fuel consumption and drag. As design for long range is so critical, it seems that the first supersonic airliners may be medium-range rather than long-range transports.

No standard configuration has yet emerged for the supersonic transport—the variety of basic layouts is almost as great as the number of design teams involved. Only general trends are evident; examples are the preference for slim-delta wings, which offer possibly the best supersonic L/D ratio, and use of a foreplane if the aircraft is not tailless.

A foreplane is chosen because of the rearward shift of the aerodynamic centre at supersonic speed. The resulting moment can be trimmed out by a lift force on the foreplane which unloads the wing slightly. If a conventional tailplane were used, a down-load on it would be needed to trim the aircraft; the wing would have to produce more lift rather than less, and the induced drag would be much greater than with the foreplane configuration.

Artificial aids to stability are widening even further the choice of configuration for supersonic airliners. In the past designers have always worked to give their aircraft natural stability; today it is possible to make use of designs which are basically unstable if they have a better L/D ratio or other advantages. Their stability is provided by "black boxes."

Automatic control also tends to help with the take-off and landing problems inherent in the supersonic transport. Compared with the subsonic airliner its ratio of cruising to landing speed is considerably higher. Its maximum usable lift coefficient is also considerably lower and its induced drag much greater. For current high-speed jet transports the ratio of E.A.S. during the cruise to that at landing is about 2.5 : 1. But if the cruising speed is raised from Mach 0.9 to 2.5 this ratio rises to 7 : 1, providing a much more difficult design problem.

Despite this, airlines are unlikely to accept an increase in landing speeds, as they have in the past with their new aircarft. In fact, they may demand that the trend be reversed, and that supersonic airliners should land more slowly than the jet airliners now entering service.

Most of the difficulties are caused by the low aspect ratio of supersonic-airliner wings. Because of their high induced drag the minimum drag speed in the landing configuration will be higher than the touchdown speed and engine thrust will have to be carefully controlled during the approach to prevent unstable and dangerous pitching of the aircraft. This can be avoided by using automatic throttle control to give conventional landing characteristics. But even with the maximum use of automatic techniques, take-off and landing requirements will demand a planform which falls short of the one giving the best supersonic range/load performance.

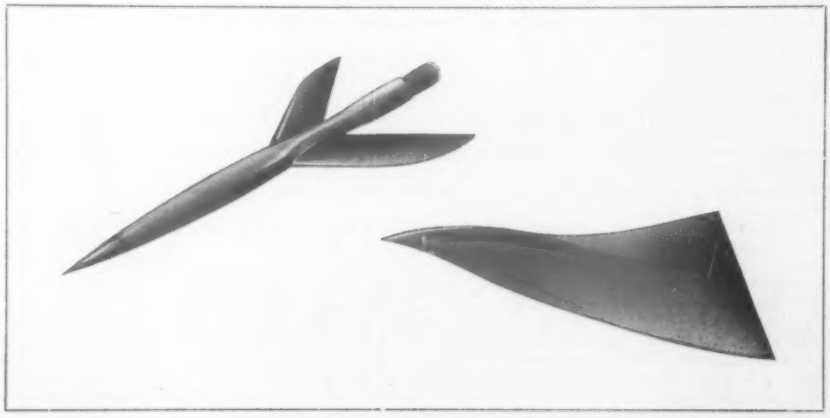
The paramount need for a good supersonic L/D ratio leads to configurations which have drawbacks in other respects. For example, the fuselage must be very slender for minimum drag. But as its diameter is fixed by passenger-seating requirements, this means that the fuselage must be very long. As a result, unless an impractically long and heavy undercarriage is used, it will be impossible for the aircraft to make its landing approach at the incidence which gives maximum lift.

Aerodynamic design for good supersonic L/D ratios is becoming much more sophisticated and precise than in the past. With a real understanding of the complicated airflow around highly swept wings, it is possible to vary their camber and twist so that each part carries a chosen element of lift. Each part of an aircraft can be designed not for individual efficiency, but as part of an integrated and effective whole, so that its best performance is achieved by favourable interference when it is working in the flow field induced by the other parts of the aircraft.

With this approach, which involves careful shaping of such parts as wing-body junctions, subsonic-flight efficiencies can be maintained up to about Mach 1.3. At higher speeds it is necessary to make wing and tail surfaces very thin and to adopt a long slender fuselage.

American work has shown that L/D ratios can be improved if lift is produced by the fuselage as well as by the wings. In theory the best results will be obtained if lifting pressures on the fuselage are similar to those on the wing, although at present such fuselage lifting forces cannot be produced without flow separation. To avoid peaks in the lift loadings along the fuselage and wing, the fuselage should carry positive lift at its front and rear but negative lift in the middle.

Other favourable interference effects can be produced by shockwave cancellation; some U.S. work in this field is described on p. 473 of THE AEROPLANE of September 19, 1958. While the arch-wing and tubular configurations which have been

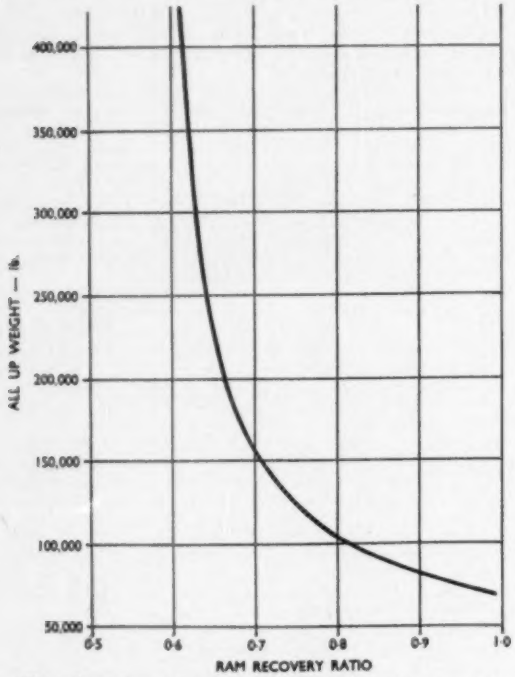


Wind-tunnel models of this type have been tested for the S.T.A.C. programme. They illustrate wing-body shaping and the use of camber on a delta wing.

evolved are on the whole rather impractical, wave cancellation between interfering bodies or surfaces can produce useful results if the added surfaces are needed for other reasons such as stability or control.

Propulsion of supersonic aircraft involves many problems. Choice of powerplant is set by the operating Mach number; the optimum speed for turbojet propulsion is around Mach 2.5, with the ramjet or combination turbo-ramjet powerplant taking over at higher speeds.

Efficient design of the engine intake is essential, and a small decrease in intake efficiency can lead to a great increase in all-up weight, as the graph on this page indicates. Although intake efficiency may demand a complex two- or three-shock system with sensing devices, spill valves and associated actuators, this complication can pay considerable dividends.



The effect of engine-intake efficiency on the all-up weight of a Mach-3 aircraft is shown in this graph. A recovery ratio of about 0.7 should be achieved; any reduction has a catastrophic effect on all-up weight.

Integration of engine and airframe design has been advocated by Mr. L. F. Nicholson, head of the R.A.E. aerodynamics department. He has shown that above Mach 3 virtually the whole airframe tends to "hide behind its intake." Early and complete co-operation between airframe and engine designers will be necessary to ensure the best compromise between a high ram recovery and a low intake drag.

Noise will be a big problem with supersonic airliners; the more powerful a turbojet the more noisy it is—and very high thrusts are needed for supersonic flight. The structural effects of engine noise can cause skin cracking and fatigue; for this reason it is likely that engines will be located at the extreme end of any supersonic transport.

Design of the structure and airframe systems for the supersonic transport are difficult. Kinetic heating of the airframe demands a structure of either titanium or stainless-steel if the aircraft is to operate above about Mach 2. Structural problems are greatly complicated by heating, which superimposes thermal stresses on those produced by normal flight loads. Differential expansion is caused by the variations in the heating rates of different parts of the airframe. Very careful structural and detail design is essential.

The structural testing of such aircraft will be complicated by the need to simulate surface heating as well as structural loads. This will be very costly and tedious; as much electric power will be needed as is used by a fair-sized town.

Heating may well impose life limitations on airframes similar to those which are now set by fatigue; fatigue effects must also be considered. A cycled kinetic-heating test similar to the current water-tank fatigue tests would be a major undertaking—but it is possible that airworthiness authorities will demand tests of this type.

Certainly every step will be taken to ensure passenger safety. The A.R.B. may well insist on many thousands of hours of flying experience before certification is given for passenger transport, particularly if there is no experience available with military aircraft of a similar type.

Airframe systems must operate at high temperatures and cooling will be a particular difficulty; ram air cannot be used above Mach 1.5, as it becomes too hot. An internal heat sink is essential, and the fuel is an obvious one. The fuel flow and the maximum temperature at which it can enter the engine will decide the peak rate of heat input—and this will decide the highest cruise Mach number when using fuel as a heat sink.

S.T.A.C. Studies

It has been suggested that the S.T.A.C. studies cover airliners cruising at three speed ranges—Mach 1.2, 1.8 and 2.5. Each of these speeds bears study.

Design of the Mach-1.2 airliner depends on the use of sweepback to preserve subsonic flow over the wing and on suitable shaping of the body-wing junction. The effect of such shaping is shown in the graph on p. 49. As mentioned earlier, Mr. L. F. Nicholson has said that with a design of this type the high efficiencies of subsonic flight can be carried over without a catastrophic drop to about Mach 1.3. In this category come the W- and M-wing configurations discussed in the past.

Considerable design knowledge is now available for the Mach-1.2 airliner and an aircraft of this type could probably be built today with relative ease. From the airline viewpoint it would represent a logical step forward in speed, although the stage-speed benefit would be slight for short-range operation. Such an aircraft would probably be the easiest to operate with the existing ATC set-up, as it could stand-off or divert at subsonic speeds without the excessive fuel consumption which plagues higher-speed supersonic airliners when flown subsonically. Its operating costs might be similar to those of present-day jet airliners.

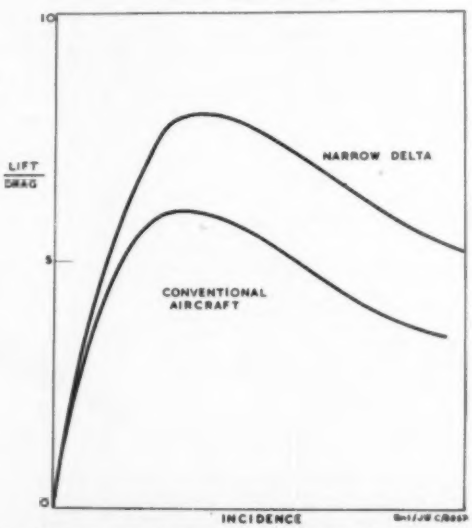
Disadvantages are that this airliner is the least ambitious of the three and that other countries with military experience of higher-speed flight may well produce a faster aircraft as rapidly; this would have a greater export appeal than the lower-speed British airliner. Lockheed, Boeing and Douglas favour a speed of Mach 2-2.5.

The Mach-1.8 airliner has probably been considered purely because it approaches the limiting speed at which current structural materials can easily be used. There is argument about this limit, but at speeds in the region of Mach 2 kinetic heating compels the use of new structural materials such as titanium and stainless steel. Economics of the Mach-1.8 airliner appear likely to be worse than those of either the Mach-1.2 or 2.5 aircraft. This is a compromise aircraft.

The Mach-2.25 or 2.5 airliner is probably the fastest aircraft which is both technically and economically feasible at present. It flies at the most efficient speed for turbojet propulsion. For the airframe steel or titanium will be necessary. This would probably lengthen the development time, although the Bristol 188 all-steel research aircraft might well provide useful experience.

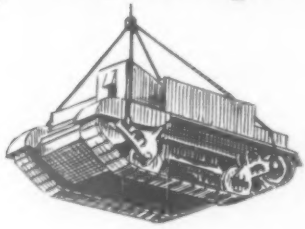
Mr. G. H. Lee, of Handley Page, has said in a lecture that

(*Continued on page* 51)



The superior L/D of the slim-delta wing at Mach numbers of about 2.5 is shown in this graph.

Heavy Duty Helicopter



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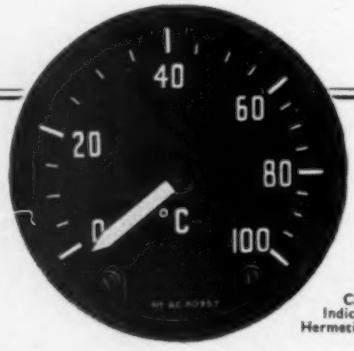

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SW/74

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Fig. 1

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Fig. 2

*

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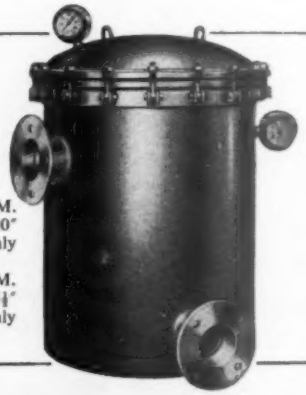

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(*Continued from page 50*)

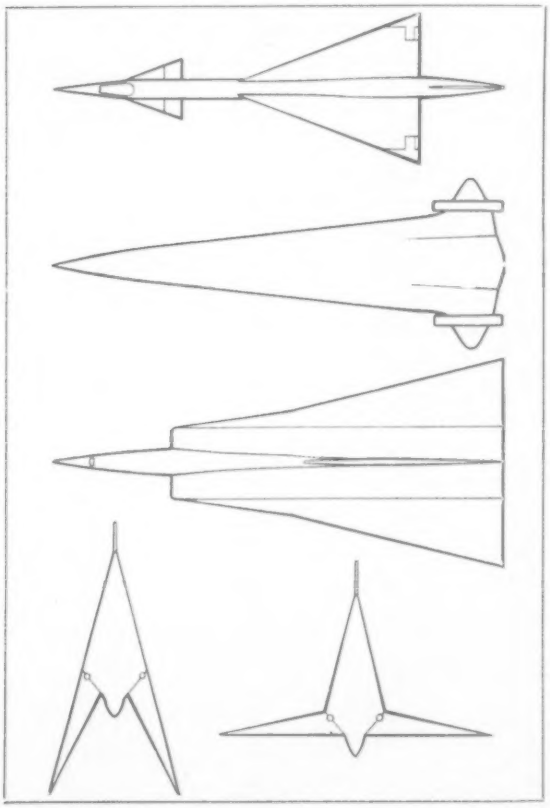
Mach 2.25 represents a range and cost optimum. Direct operating costs should be less than 25% above those of current aircraft; this airliner would thus be cheaper to operate than its Mach-1.8 rival, but possibly more expensive than the Mach-1.2 aircraft.

From many points of view the Mach-2.5 or 2.25 aircraft is the one to be preferred. But it represents a big advance for operators, airworthiness authorities and ATC systems to accept, particularly if it is not backed, as current jet airliners have been, by extensive military operation of comparable aircraft.

Company Projects

The companies associated in the work of the S.T.A.C. have been given as A. V. Roe, Bristol, de Havilland, Handley Page, Rolls-Royce, Shorts and Vickers-Armstrongs. Since then Faireys have also joined in these studies.

As well as their collaborative studies for the S.T.A.C., it appears that companies are working on their own supersonic projects. Sketchy information has been given on projects by Bristol, Handley Page, Vickers and Rolls-Royce; these will bear

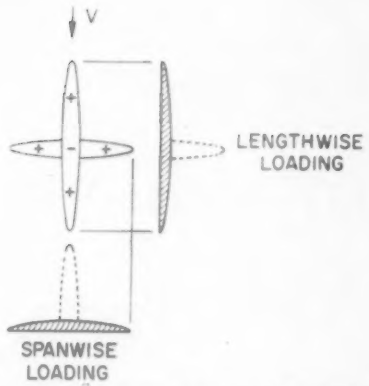


These supersonic planforms are (top to bottom), a Mach-2.5 Handley Page project, a Rolls-Royce Mach-2.6 slim-delta which uses jet-lift for vertical take-off and landing, a Bristol Aero-Engines' project for a Mach-3 trans-Atlantic airliner, and the Wallis Swallow project, which depends on variable geometry for its landing and take-off configuration (right).

examination. They show a range of approaches and clearly the ultimate configuration is still in the melting pot.

The Bristol proposal is for a Mach-3 airliner with a turbo-ramjet powerplant integrated with its structure. The wing is a slim-delta with reduced sweep toward the tips. It is claimed that such an airliner could carry 150 passengers from London to New York in just over 2 hr. at an operating cost comparable with that of the Britannia when flying over the same route. This airliner obviously would involve many development problems and seems a likely second-generation supersonic transport.

Handley Page has used the airliner configuration shown at the head of this article to illustrate accounts of both supersonic bomber and transport design. It is a Mach-2.5 aircraft with a slim-delta wing and foreplane; this could well be an early project study for a supersonic bomber, and now outdated.



Supersonic L/D ratios can be improved by fuselage lift. Spanwise and lengthwise loadings for a lifting fuselage and wing in supersonic flight show that negative lift is needed at the fuselage centre to avoid peaks in the loadings. This illustration is from an N.A.C.A. paper by R. T. Jones.

Although there are probably other Vickers designs, the only one so far discussed openly has been the Swallow project of Dr. B. N. Wallis. This uses variable sweepback to give the best configurations for both supersonic and slow-speed flight. At low speed its pointed and highly swept wings are swept forward, giving in effect a crescent planform with good low-speed characteristics for take-off and landing. The project dates back to before the days of the S.T.A.C.; it is now reported to be under serious consideration by the U.S., although presumably for military rather than civil applications.

The Rolls-Royce project is a VTOL slim-delta transport which has banks of small jet-lift engines for take-off and landing. The idea is to make use of the best planform for cruising flight without any compromise with low-speed requirements, and thus to obtain the best supersonic range-load performance. It has been estimated that an airliner of this type would have an all-up weight of only 175,000 lb. if it were to carry 100 passengers non-stop across the Atlantic at Mach 2.6. More "conventional" supersonic airliners are likely to have an all-up weight in the 300,000-lb. class. The VTOL approach has been sponsored by Dr. A. A. Griffith.

But the VTOL supersonic airliner has many potential drawbacks—for instance, its jet-lift engines will make up about 10% of the aircraft's total weight and, in addition, will consume in fuel some 3% of the airliner's all-up weight for each minute they are running. Take-off and landing techniques and times will thus be critical. A supersonic airliner of this type is 20 years away, according to Dr. C. T. Hewson of Rolls-Royce.

Conclusion

The approaches to the supersonic airliner are many and varied; they depend to a large extent on the design assumptions made. Configurations are still wide open, but there does seem to be a definite trend to the slim-delta wing which promises L/D ratios up to perhaps 8.

It seems likely that Britain can afford only one supersonic airliner; it is doubtful whether this can usefully serve both B.O.A.C. and B.E.A. But even if both Corporations order this aircraft, export orders will be essential if the vast development costs are to be justified.

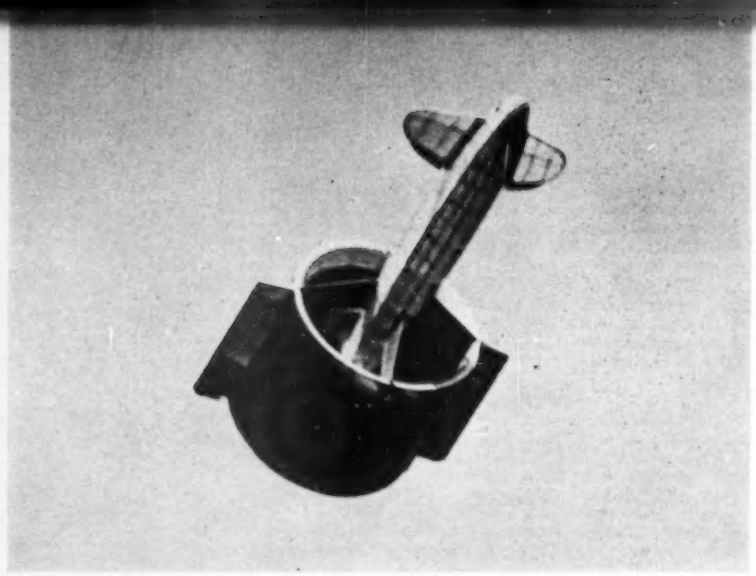
The work of the S.T.A.C. is swathed in secrecy. Its studies, designed to find the most economic type of supersonic airliner, could go on indefinitely. In the dynamic field of aeronautics perfection can never be reached—improvement is always possible, but it just takes longer.

These studies pose difficult political and financial problems for the Government. Politically, any decision on the construction of a supersonic airliner must affect the future structure of the British aircraft industry and the employment of many people. Financially, the Government must decide whether spending perhaps £100 million on developing a supersonic airliner is in Britain's best interests; is this expenditure the best way to ensure aeronautical exports in future, or could the money be better spent on other aircraft developments?

Decision on these points will prove difficult and possibly embarrassing. But a decision should not be delayed, although an excellent excuse for this could be given by an indefinite extension of the S.T.A.C.'s studies in search of technical and economic perfection. The U.S. and Russia are not standing still; if a British supersonic airliner is built too late, it will have no export appeal and may prove a very costly white elephant.

Wingless High-speed VTOL

Howard Levy photographs



Above a scale model of a ducted Aerodyne in free flight.

ALTHOUGH little has yet been released about Dr. A. M. Lippisch's wingless VTOL aircraft, the Aerodyne, development is continuing at the Collins Radio Aeronautical Research Laboratory, Cedar Rapids, Iowa, of which he is director.

For VTOL aircraft, Dr. Lippisch, who was associated with Messerschmitt in Germany during the Second World War, advocates a wingless configuration. He says:—

> It is obvious that wings are of no use for hovering flight. At the other end of the velocity scale, the reduction of the drag is of major importance to obtain better transport economy. The lowest resistance per volume can certainly be obtained by a slender body only. If an internal-flow system can be designed which can lift and propel this body, the final solution can be arrived at. Actually this development trend from large wings to small wings, and finally to no wings at all, can well be extrapolated from the aircraft designs of the last decade.

Collins consider that a new concept which would have its application in different types of future aircraft must have high-speed potential in addition to hovering capability, and Dr. Lippisch's endeavours are directed towards the evolution of an aircraft which consists only of a body, lifted and propelled by an internal-flow system where both major components are generated from one common source of energy.

Wind-tunnel tests and tethered and free-flight scale models have been used to study various configurations, including plain shroud, shroud with fins, and twin-shrouded bodies. At present work is being done with a full-size Aerodyne test bed. Results, it is claimed, show that as regards overall performance such VTOL aircraft are superior to conventional VTOL designs for cruising speeds above 400 m.p.h.

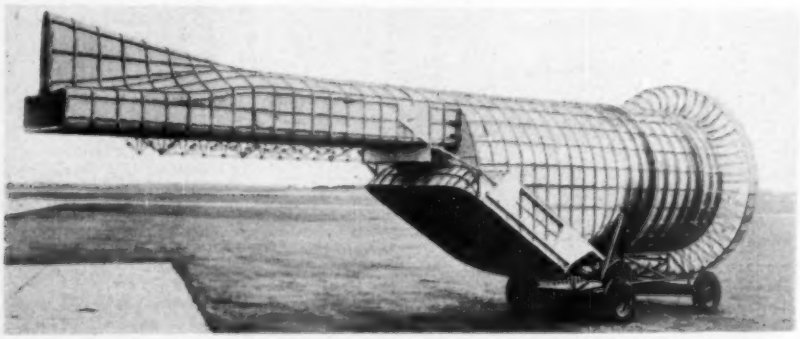
Advantages include lower structural weight, simpler construction, lower cost, better loaded/empty weight ratio, higher maximum speed and better range.

Much basic research has still to be done, but the following conclusions have been reached by Dr. Lippisch:—

> (1) The investigation of flow mechanics of a flying body with internal propulsion shows that the characteristics of such aircraft configurations are similar to those of a conventional aircraft with low aspect ratio.
>
> (2) The interaction of the core flow with higher energy level and the external flow around the body offers flow problems which must be investigated more thoroughly by basic research. Our present-day knowledge points to the fact that favourable combinations can be developed if these effects are properly understood.
>
> (3) The flight-testing of tethered and free-flight models has shown that the stability problems can be solved and that inherent stability in forward flight can be obtained.

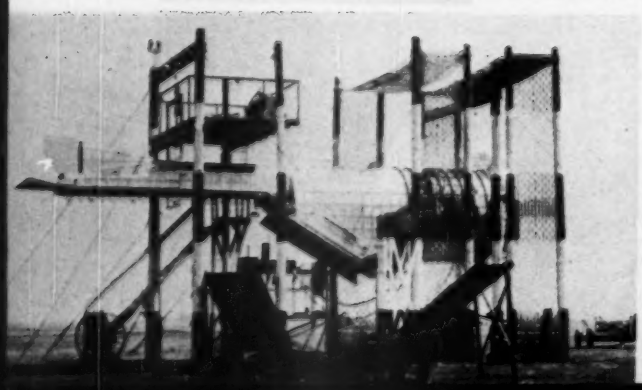
HOWARD LEVY.

Left, another Aerodyne configuration, shown by a model in free flight.

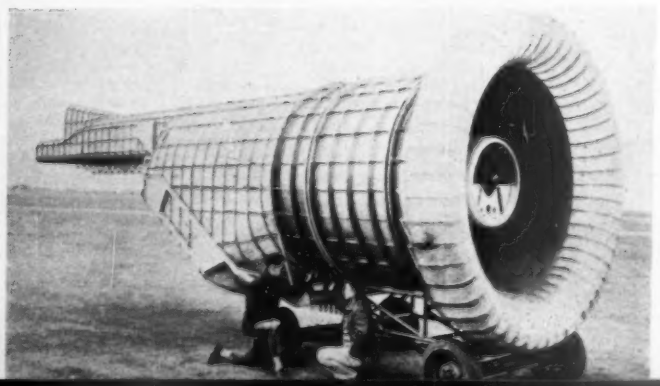


Above, another view of the full-scale aircraft before installation in the test bed. Air is cascaded out from the rear of the forward section at an angle of 40°.

Below, the full-scale aircraft installed in the test bed.



Below, the full-scale Aerodyne showing the ducted-fan powerplant.



News About People

(*Continued from page 35*)

DOWTY DIRECTOR.—Mr. Norman H. Payne, B.Sc., M.I.Mech.E., A.F.R.Ae.S., a director of Dowty Fuel Systems, Ltd., of Cheltenham, for the last two years, has been appointed managing director in succession to Mr. Stuart Davies, who recently joined the Hawker Siddeley Group. Mr. Payne was apprenticed to Armstrong Siddeley Motors. From 1939 to 1944 he was with Rotol, and thereafter, until 1952, was chief development engineer (piston engines) with de Havillands. He was chief engineer of Normalair from 1952 to 1956.

ESSO CHAIRMAN.—Mr. H. C. Tett, formerly a managing director and chief executive of the Esso Petroleum Co., Ltd., has been appointed chairman and managing director following the retirement of Sir Leonard Sinclair. He joined Esso in 1928; for a period during the Second World War he served as a member of the technical advisory committee of the Petroleum Board of the Aviation Supply Committee.

MICROCELL MERGER.—The Microcell Group of companies is to be merged with the B.T.R. Industries Group. The present directors of Microcell, Ltd., will continue in office and Mr. H. Kremer will remain chairman and managing director. He will also join the board of B.T.R. Industries, Ltd. Dr. W. D. Scott, assistant managing director of B.T.R. Industries, Ltd., and Maj. C. J. P. Ball, another B.T.R. director, are to join the board of Microcell, Ltd.

RESEARCH DIRECTOR. — The English Electric Co., Ltd., has announced that Dr. Philip Bowden, C.B.E., F.R.S., D.Sc., Sc.D. (Cantab.) has been elected to the board and is to devote part of his time to problems associated with the co-ordination of the research activities of the group. Dr. Bowden is Professorial Fellow of Gonville and Caius College at the University of Cambridge, and Reader and Director of the Research Laboratory for the Physics and Chemistry of Solids, Department of Physics.

FAIREY CHANGES. — At Fairey Aviation Co. of Canada, Mr. S. G. Dixon, O.B.E., Q.C., relinquishes his position as president and becomes chairman; Mr. C. E. Hibbert, M.B.E., managing director and vice-president, becomes president. Mr. A. C. Earle, the plant manager, has been appointed general manager.

B.E.A. TOUR. — Mr. Anthony H. Milward, chief executive of B.E.A., left by Comet 4 to Montreal on January 3 for the start of a 26-day World sales tour.

R.A.F. INSPECTION DIRECTOR.—Mr. C. F. Burden, O.B.E., has recently been appointed the first civilian director of the Air Ministry Aeronautical Inspection Service since its reorganization in 1947. Succeeding Air Cdre. C. E. Hartley, C.B.E., who has retired from the Service, Mr. Burden has been deputy director, A.I.S., since 1948.

B.W.I.A. CHANGES.—Mr. H. O. B. Wooding, Q.C., has now been appointed chairman of British West Indian Airways in succession to Sir Errol dos Santos (see THE AEROPLANE, November 28, p. 780). Air Cdre. G. J. Powell, C.B.E., has been appointed to the board as the B.O.A.C. member in place of Sir George Cribbett, K.B.E., C.M.G., who is chairman of B.O.A.C. Associated Companies.

R.A.F. PROMOTION.—Air Vice-Marshal W. H. Merton, C.B., O.B.E., Air Officer in charge of Administration, Bomber Command, has been promoted to the rank of Air Marshal. This is an addition to the half-yearly promotion list published by the Air Ministry last week. (See also page 33.)

Military Aviation Affairs

R.N. CARRIERS. — Rear Admiral C. L. G. Evans, C.B., C.B.E., D.S.O., D.S.C., has been appointed Flag Officer Aircraft Carriers in succession to Vice-Admiral A. N. C. Bingley, with effect from this month. Serving as Deputy Chief of Naval Personnel (Officers) since October, 1957, Rear Admiral Evans, one of the most famous Fleet Air Arm pilots of the 1939-45 War, was previously Flag Officer Flying Training.

MALAYAN AIR FORCE. — The nucleus of the Royal Malayan Air Force was formed recently in Kuala Lumpur when 14 members of the Royal Air Force (Malaya) were transferred to the new Service.

INDIAN SEA HAWKS.—The Indian Government recently announced that Hawker Sea Hawks are to be purchased from Britain for the Indian Navy carrier "Hercules" (16,000 tons), which is at present undergoing modernization and a refit in the U.K.

FIFTY FIATS.—The U.S. is to procure 50 Fiat G.91 fighter-bombers for deployment with its European allies, according to a recent NATO statement. The experimental international squadron formed in Italy is soon to move to Germany to train with NATO ground units.

ARMY ORDER.—The French Army has ordered 100 Nord 3202 low-wing two-seat trainers (240-h.p. Potez 4.D-32 engine).

AUSTRALIAN BOOSTERS.—Lockheed P2V-5 Neptunes of No. 11 Sqn., R.A.A.F., are to be fitted with two Westinghouse J34 turbojets each in underwing pods. Stating this, the Australian Minister for Air said that the modification, estimated to cost £A775,000, would enable the R.A.A.F. to use the Neptunes at least until 1970. The aircraft would be flown to the Lockheed Los Angeles plant for modification.

OXFORD U.A.S. MOVE.—Members of the Oxford University Air Squadron will in future undertake their flying training at R.A.F. Bicester. The squadron, which has been stationed at R.A.F. Kidlington for a number of years, was due to move to Bicester by the end of last month.

BRIGHTON AIR WEEK. — The R.A.F.A. is organizing, in conjunction with Brighton Corporation, an air week from May 30 to June 7, culminating with the Association's annual conference. The week will begin with an air display at Shoreham, in which the R.A.F., U.S.A.F. and other air forces will take part. During the week there will be an athletic meeting, a Service tattoo, special film shows, and concerts by the R.A.F. Central Band, etc.

POINT COOK.—The last R.A.A.F. pilots to be trained on Wirraways graduated from the R.A.A.F. College, Point Cook, on December 10, when members of the passing-out course received their wings from the Australian Minister of Air, Mr. F. M. Osborne. At the graduation U/O. R. W. Bradford became the first cadet in the history of the College to be awarded all but four of the prizes, including the Sword of Honour and the Queen's Medal.

ARGENTINE TRAINERS.—Of the 48 Morane-Saulnier Paris armed trainers on order for the Argentine Air Force, only 12 will be shipped from France in parts for assembly in Argentina. The other 36 will be built entirely at the Government factory at Cordoba.

R.A.F. HISTORY.—The third and final R.A.F. volume in the United Kingdom Medical History Series of the 1939-45 War has been published by H.M. Stationery Office, price £5 5s.

FOR MISSILE EVALUATION.—One of the Gloster Meteor U.15s, converted by Flight Refuelling Ltd. from Meteor F.4s, used by the R.A.A.F. at Woomera. The wing-tip recording cameras are apparent.

Private Flying

● AS briefly reported in our issue of November 21, Mr. Charles W. Morley is now managing director of a new company called Morley Aviation, Ltd., which is now the holding company of the **Herts and Essex Aero Club.** This means that Mr. Roger Frogley has relinquished control of the club, and in a recent message he thanks all members, past and present, for the support given to the club.

The club came into being as long ago as 1931, when an official opening took place at Broxbourne on June 14. The club owes its beginning to the enthusiasm of the two Frogley brothers and Mr. F. E. Mockford. The first secretary was Mr. F. E. Darlow, and the first C.F.I., Mr. W. R. Bannister. Initially a Cirrus Moth was operated.

A move was made from Broxbourne to the present base at Stapleford Tawney in the spring of 1954. The aircraft fleet now consists of a Hornet Moth, a Gemini, Tiger Moths and Austers.

● THERE were only six flying days in November for the **Lancashire Aero Club** at Barton, resulting in a total of 46 hr. 25 min. flying. During this period Mr. Wienholt flew solo.

● WE regret to record the death of Mr. Arthur H. Phillips, O.B.E., of Clifton, Bristol, at the age of 67, on December 24. He was a director of the Bristol and Wessex Aeroplane Club and had been associated with private flying for a great many years. In fact, his first flight was in a Bristol Box-kite in 1911.

FAIR OAKS PUPIL.—Cdt. Flt. Sgt. Charles Munday, 19, of the Hampstead A.T.C., is learning to fly with the Fair Oaks Aero Club under the flying scholarship scheme.

Gliding Notes

by Dr. A. E. Slater

FOR the first time a conference entirely devoted to "Safety" was held on December 13 at the Kronfeld Club. This does not mean, of course, that the subject has never been discussed before; it has, in fact, taken up a large proportion of each of the Instructors' Conferences held annually.

Both at those events and at the recent Safety Conference the subject was conveniently divided into accident statistics and instruction methods, and the statistical side, as often before, was presented by Air Cdre. Christopher Paul. Ever since he made the first analysis nine years ago, he has taken cost in money to be the most important criterion, because damage to the pilot is rare, and is so much a matter of chance that it bears no relation to the question how any particular kind of accident can be eliminated.

Note that "eliminated" is the word, not "reduced." In his very first report, that for 1949, Air Cdre. Paul gave his conclusion that *all* accidents are avoidable; in fact, his terms of reference have always been: "to assist clubs to eliminate accidents by analysing and reporting upon all relevant information available."

Here there are two important words: "relevant" and "available." It has to be continually drummed into the clubs that they are not to confine their reports to cases of actual breakage, but should report everything that might have led to an accident even if, by fortunate chance, it did not lead to one on that occasion. There seems to be a recurrent tendency to regard the filling-in of the report forms as an admission of guilt, rather than as a necessary means of cutting down the future accident rate: so much so that, in 1954, only 15 reports were sent in.

* * *

A NUMBER of highly coloured diagrams were displayed on the wall by Air Cdre. Paul, which, he explained, were not alternative designs for the R.34 memorial, but the result of 10 years' analysis of accident reports sent in to the British Gliding Association. There were about 550 reports during this period, though many came under the heading of "incidents" rather than accidents.

The first diagram showed the total cost of reported accidents each year from 1949 to 1957 inclusive, starting with 55 costing £3,621 in 1949, then remaining fairly steady year by year, until in 1955 they rose to a minor peak, and in 1957 to a worse peak of 103, costing £7,151. These two years included national contests, in which several people ran into trouble when landing in strange places at the end of cross-country flights.

One voice was raised in questioning the value of showing total cost—that of Derek Piggott, chief instructor at Lasham, who wanted to know the proportion of major and minor accidents, as a help in deciding how best to get down to eliminating them. However, Air Cdre. Paul has not had unlimited time to subdivide the statistics, and in any case he thought they should be kept as simple as possible if people are to be encouraged to learn the lessons that they teach.

In the next diagram, the total cost of reported accidents each year was divided into the number of launches, and the result showed little variation with the years, being 1s. 4d. per launch in 1949 and 1s. 5½d. in 1957; considering the fall in the value of money, these figures show an improvement—a very different impression from that given by the first diagram.

The third diagram divided the accidents into the stage of flight at which they occurred, again showing the total cost. The "hops and slides" category died out by 1953, when primary solo training practically ceased. Landing accidents, which were at first the most expensive category, dropped to a low figure in the same year, and have only shown signs of growing again in the "peak" years 1955 and 1957.

* * *

BY far the most troublesome stage of flight is on the approach to land, before actually landing; and the same has been found in the United States where 10 out of the 25 accidents analysed in 1957 came into this category. In fact, Air Cdre. Paul produced another diagram which subdivided them further into six categories, of which easily the worst was "stretch, stall and spin," resulting from trying to stretch the final glide into a flatter angle than the machine was capable of.

"Stretch, stall and spin" accounted for 34 accidents, costing £5,884, in 10 years, including 1958 "so far," and the 1958 figure alone was nine, costing £2,566. "Hit obstruction" came next in order of total expense, followed by "hanging on" (searching for lift instead of preparing to land), hitting a wing tip on a final low turn, under-shooting, and miscellaneous.

Another diagram divided the pilots involved into categories according to experience, from which it looked as if those with more than 5 hr. were easily the most dangerous in recent years, but this may well be because there are so many of them and they do such a lot of flying.

Then there was a diagram giving the category of sailplane involved, showing accidents to high-performance machines to have increased enormously since 1953; this was generally attributed not only to their increased number, but to pilots being allowed to fly them at a much earlier stage of training than when there were few available.

The afternoon session was given up to arguments on the subject of training methods.

Ann Welch led off by insisting that the object of gliding instruction is not to get the pupils off solo as soon as possible, but to train them in such a way that they would eventually become good and safe soaring pilots, capable of doing cross-countries and other things for which advanced sailplanes are designed. The implication here is that the pupil's training must continue until he has reached this desirable stage; but, unfortunately, that kind of training involves the instructor spending a lot of time on the ground so as to watch how his pupils fly.

Since most instructors are volunteers they may be liable to walk off if they are asked to do this, especially as one of the main incentives to become an instructor is the amount of free flying one gets. So the average club member, once he has been guided through the earliest stages of solo flying, is left to teach himself the high-performance work and to develop bad habits meanwhile, as several speakers pointed out.

Another possible way to avoid this is to prolong the dual training period so as to give time to inculcate habits which will make for safety at the later stages of solo flying. One good habit is to keep a good look-out all the time, whether there are other machines in the sky or not. Another need, which many people wanted to see catered for, is much practise in spot-landings, against the day when the pilot goes away and has to land in a strange field. Derek Piggott was insistent that pupils should be taught how to plan ahead, instead of flying "from minute to minute." (This reminded me of the pre-War days when an "advanced pilot" could be defined as one who had advanced beyond the stage of thinking out his landings beforehand.)

* * *

MANY instructors, Ann Welch complained, use a negative instead of a positive approach; pupils should be told not merely to correct the attitude of the machine but to make it do things; for instance, "Put the wing down—now bring it up again," rather than "Take off bank." Particularly she criticized the "woodpecker" instructor, who keeps tapping the altimeter; the pupil picks up the habit and eventually, preparing to land in a strange field whose altitude above sea-level is different from that where he was trained, plans his approach by watching the altimeter, with disastrous results.

Shortage of cash was given by Ann as a reason why many clubs could not plan their fleets to suit a properly designed training programme. But the shortage which cropped up most frequently in discussion was that of the kind of instructor who not only knows enough to advise others on the art of cross-country flying but is willing to give up his time to the job and, even if willing, can be spared by the club from the more immediate necessity of training new members in the elementary stages.

Correspondence

The Third Man

THE very informative and interesting article "Cleaning Up the Flight Deck" in your issue of December 19 was of great interest to our Association. The "bite" was in the last paragraph.

Your correspondent's conclusion—"That the trend in big aircraft was towards the use of a third pilot as a flight engineer"—was not surprising as the meeting was B.A.L.P.A.-organized and they are following the I.F.A.L.P.A. party line.

The view of the two very senior and experienced test pilots, Mr. D. P. Davies of the A.R.B. and Wing Commander W. F. Gibb of the Bristol Aeroplane Company were, according to the text, completely opposed to the above impression and both supported the qualified flight engineer as the third man.

London, E.1. J. G. K. GREGORY,
Assistant General Secretary Civil Aviation.
The Merchant Navy and Air Line Officers Association.

That Junkers Ju 52

REFERRING back to your issue of November 21 I see that an editorial note regarding the single-engined Junkers Ju 52 follows a letter from Mr. G. W. Cannon in Queensland. May I say that the Ju 52 was originally a one-motor aircraft with the Armstrong Siddeley Leopard engine.

Munich, Germany. WALTER ZUERL.

[We are glad to have this confirmation from the distinguished editor of *Der Flieger* that the famous Ju 52 began life as a single-engined aeroplane and most interested to learn of the installation of such a well-known British aero-engine.—ED.]

Meteor and Hornet

I WOULD be obliged if you could settle a couple of points for me.

First of all, when did the Gloster Meteor first go on active service with the R.A.F.? Some of us are convinced it was used to combat the V1; others are equally convinced that it did not get to the squadrons until after the War.

Secondly, what was the name of the twin-engined, single-seat plane that de Havilland built after the Mosquito? I am certain that this was the Hornet, but another ex-R.A.F. member of the R.C.A.F. Auxiliary is of the opinion that Westland built the Hornet. I think he's getting mixed up with the Welkin.

I decided to appeal to you because the various viewpoint holders are getting more dogmatic every time we meet, and resolution by undisputed authority seems necessary.

Victoria, B.C. PETER HUNT.

[Meteor Is first went into service with No. 616 Squadron in July, 1944, and were used from Manston against flying bombs. The squadron later went to the Continent with 2nd T.A.F., where its Meteor IIIs were employed mainly on ground-attack duties.

The name of the de Havilland twin-engined, single-seat aeroplane built after the Mosquito was the Hornet.—ED.]

More About MACships

OUR attention has been drawn to the letter published in your issue of December 19 regarding "Mac" ships. We managed "Empire MacAlpine" and "Empire MacKendrick," which vessels were not modified but were specially built for the carriage of bulk grain while also being able to work Swordfish aircraft.

The flight deck was rudimentary in that the vessels were only of 12 knots and the flight deck was shorter and narrower than in a proper carrier. On the other hand it was fitted with arrester wires and the vessel had a lift with a hangar below deck in which could be accommodated all four Swordfish.

Edinburgh, 2. WM. THOMSON AND CO.

More Heliports Wanted

THE "run your own airfields" campaign of the Ministry of Civil Aviation would have some attraction for municipalities if the Minister would initiate a go ahead scheme for rapid development of the multiple-seater helicopter and Rotodyne.

Given enough backing both Faireys and Westlands could have their 48-seaters ready for public transport by, say, 1963.

If the Ministry also undertook a bold plan to encourage municipalities to erect a platform over the railway station as an airbus terminal or arrange other suitable city-centre sites, then the municipally owned airfields would know a new lease of life between 1963 and 1970.

When hundreds of "choppers" transform the transport life of Britain, as they surely will, these airfields will be required as fuelling halts; depots; for hangarage; repair; servicing; maintenance and possibly construction of "choppers" and ultimately of "hoppicopters."

These airfields could become money spinners by this development in the final quarter of this century if the Ministry instead of just throwing the airfields back in the laps of the municipalities will initiate a nationwide scheme which will bring them prosperity.

Rottingdean, Sussex. WILLIAM COURTENAY.

Wroundabout

WREVIEW OF 1958

Good for Cowsill. The name of G. E. Cowsill of Prestwick stands high on Wroundabout's 1958 Honours List. When he read this magazine's article "Electra in England," the sentence "The only servicing problem of note was the replacement of a seal in one engine" caught his eye, demanding fair comment. "Have the Americans progressed beyond man-powered flight and now employ animals?" he wrote, "Sounds fishy to me." But then, of course, there was a Salmon in the cockpit.

*

Super Human. But one of the '58 American fields of endeavour is "Human Factors Engineering." There is even a Human Factors Society of America. How far-sighted, then, for Grumman Aircraft to appoint a Chief Human Engineer, by name of Clifford P. Seitz. But what does this make the rest of the Grumman team?

*

Light in our Darkness

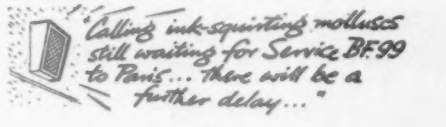
Then there was the time I asked a pilot to reveal the secret of his splendid night-landing technique. "Oh, no secret," he replied, "I just have a flare for it."

*

On that subject, let me quote Scottish Aviation's chief test pilot "Cap" Capper, whom I met at Alvis's after he'd flown a Twin Pioneer down from Prestwick: "Night flying on this aeroplane is simply day flying in the dark."

*

Time Flies. G. A. Don Bourne, Barclays Bank manager at London Airport, retired at the end of 1958. A dedicated aviation enthusiast, he will carry on as an Observer Commander in the Royal Observer Corps. His inquiring mind enables me to give you the impressive news that when you pass through the Central Area's Concourse to be borne aloft in man's modern machinery, you walk on Derbydene, a fossil limestone. If you look closely you can see the fossilized belemnites which, says Don, are ink-squirting molluscs which have been there for 220 million years. From letters I read in the papers, they seem to have something in common with disgruntled airline passengers.

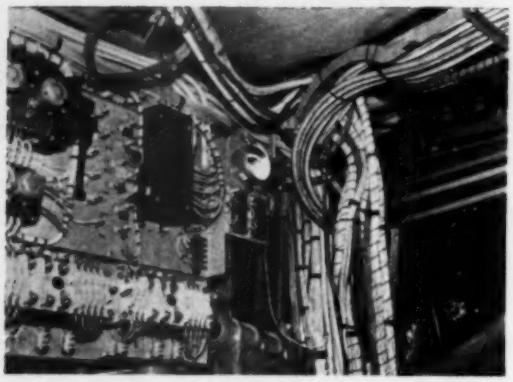


*

At the Sopwith Apprentices Reunion: "When I was at Sopwiths at least I knew whether I was bored or punched. In these days of aircraft electrickery, I don't know whether I am on my AC or DC."—*Bill Warner, now Chief Engineer, Air Transport, Airwork Services, Ltd.*

by Wroundabout

NOTES AND EVENTS



VANGUARD WIRING.—From the work undertaken by British Insulated Callender's Cables, Ltd., on wiring problems in the Vanguard a number of cables have been developed to Vickers' specifications. Except for these, B.I.C.C. Nyvin and Tersil cables, as seen here during installation in the main electrical bay of the first Vanguard, have been used throughout.

ELECTRONICS COURSE. — From February 9 to 27 a course on the Application of Electronic Techniques to Wind Tunnel Testing will be held at the AGARD-NATO Training Center for Experimental Aerodynamics, Rhode-Saint-Genèse, near Brussels. Students should be of university degree standard in engineering or physics. There are no fees for the course. Full details can be obtained from the director, TCEA, 72 Chaussée de Waterloo, Rhode-Saint-Genèse, Belgium.

PULLIN BLOWER.—A new blower—type PM.1C—has been introduced by R. B. Pullin and Co., Ltd., of Brentford, Middlesex. The unit, delivering approximately 15 cu. ft. of air/min. against a back pressure of 0.7 in. of water, is suitable for cooling electronic equipment.

THERMOPLASTIC WELDING.—A joint committee sponsored by the Institute of Welding, the Plastics Institute and the British Plastics Federation, has been set up to consider the technological needs of industry as regards the welding of thermoplastic materials and to take action to meet these needs.

PIPE COUPLING.—The King Aircraft Corpn. of Hillington, Glasgow, has developed a pipe coupling for use in the 6,000-p.s.i. pressure range at operating temperatures from −184° C. to +980° C. Termed "Conoseal," the unit is based on the vee-band clamp principle and is available in standard form for pipes from ¼-in. to 10-in. bore diameter.

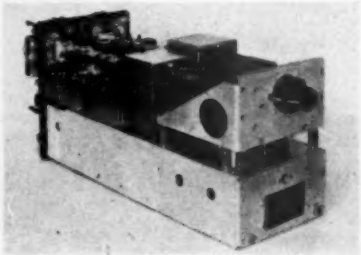
ATOMIC ENERGY.—Teddington Aircraft Controls, Ltd., of Merthyr Tydfil, a member of the Teddington group of companies controlled by the British Thermostat Co., Ltd., has announced the formation of an Atomic Energy Division. Mr. C. D. Boadle, formerly of Harwell and Rolls-Royce, Ltd., has recently joined the company and has been appointed technical manager of this new division with Mr. C. R. Peter as liaison executive.

HOT TAPE.—An improved-quality high-temperature marking tape has been developed by John Gosheron and Co., Ltd., the Packing and Industrial Tape Centre, Vauxhall, London, S.E.11. A crêpe paper tape with a firm adhesive, it has a working temperature range from 130° C. for 12 hr. use to 180° C. for 1 hr. application.

METAL TREATMENT.—The cold Bonderite system for the spray pretreatment of metal is now available in the United Kingdom through the Metal Finishing Division of the Pyrene Co., Ltd., Great West Road, Brentford, Middx. The system includes new cold alkali cleaners and a new cold Spra-Bonderite process.

SAFETY HARNESS.—The Ministry of Supply has issued Aircraft Material Specification D.T.D. 810A covering safety harness webbing. Superseding the earlier specification, it deals with the manufacture, finish and properties of webbing.

PRICE REDUCTION.—Texas Instruments, Ltd., of Bedford, has announced the third substantial price reduction of its silicon semiconductors within 12 months. The prices of almost all Texas transistors and rectifiers have been reduced, some by as much as 35%.



COMET COOLING.—A specially modified 1-in. blade dia. Plannair axial flow blower (extreme right) installed in one of the four navigation/communication receivers developed by Amalgamated Wireless (Australasia), Ltd., in conjunction with Marconi Wireless Telegraph Co. for the D.H. Comet 4. The blower maintains a cooling air flow of 18 cu. ft./min.

New Patents

APPLICATIONS ACCEPTED

808,888.—Goodrich, Co., B. F.—"Inflatable coverings for airfoils."—Nov. 9, 1956 (Nov. 18, 1955).

808,938.—Bölkow, L.—"Helicopter trainers."—Nov. 2, 1956 (Nov. 4, 1955).

808,852.—M.L. Aviation Co., Ltd.—"Collapsible structures."—Feb. 8, 1957 (March 8, 1956).

808,740.—Reimbert, M.—"Bladed rotors and in particular ship propellers."—May 4, 1956 (May 9, 1955, and Jan. 25, 1956).

Applications open to inspection on Feb. 11, 1959; opposition period expires on May 11, 1959.

Aviation Calendar

January 12.—R.Ae.S. Henlow Branch lecture, "Vertical Take-off and Landing," by D. Keith-Lucas (chief designer, Short Bros.), in Building 62, R.A.F. Technical College, **Henlow,** at 19.30 hrs.

January 13.—R.Ae.S. lecture, "Stress Corrosion—The Engineer's View," by P. H. Wall, in the library, 4 Hamilton Place, **London,** W.1, at 19.00 hrs.

January 13.—R.Ae.S. Boscombe Down Branch lecture, "Experiences on the Trans-Antarctic Expedition," by Sqn. Ldr. J. H. Lewis, in the lecture hall, A. and A.E.E., **Boscombe Down,** at 17.45 hrs.

January 14.—R.Ae.S. Brough Branch, Young People's Christmas Lecture, at Newland High School, Cottingham Road, **Hull.**

January 14.—R.Ae.S. Manchester Branch lecture. "Nuclear Reactors for Power Production," by T. M. Greenlees, in the Reynolds Hall, College of Technology, **Manchester,** at 19.30 hrs.

January 14.—R.Ae.S. Christchurch Branch lecture, "The Rotodyne," by Dr. G. S. Hislop (Fairey Aviation), at the King's Arms Hotel, **Christchurch,** at 19.30 hrs.

January 14.—R.Ae.S. Chester Branch lecture, "Development of the Civil Avon Engine," by E. Ell's (Rolls-Royce), in the lecture theatre, Grosvenor Museum, **Chester,** at 19.30 hrs.

January 14.—Institution of Production Engineers, Wolverhampton Graduate section lecture, "High Speed Machining in the Aircraft Industry," by S. Radcliffe, at the Wolverhampton and Staffs College of Technology, Wulfruna Street, **Wolverhampton,** at 19.00 hrs.

January 15.—British Institution of Radio Engineers, Scottish section lecture, "Satellite Development and the Moon Rocket," by P. H. Tanner, at the Institution of Engineers and Shipbuilders, 39 Elmbank Crescent, **Glasgow,** at 19.00 hrs.

January 15.—R.Ae.S. Glasgow Branch, Graduates and Students Section, question night and film show, in the engineering department, University of **Glasgow,** at 19.30 hrs.

January 16.—Institute of Navigation lecture, "Blind Landing Problems," by W. J. Charnley (superintendent, R.A.E. Blind Landing Experimental Unit), at the R.G.S., 1 Kensington Gore, **London,** S.W.7, at 17.15 hrs.

January 16.—British Institution of Radio Engineers, Scottish section lecture, "Satellite Development and the Moon Rocket," by P. H. Tanner, at the department of Natural Philosophy, The University, Drummond Street, **Edinburgh,** at 19.00 hrs.

January 16.—R.Ae.S. Cambridge Branch, lecture by Dr. N. A. de Bruyne (CIBA (A.R.L.), Ltd.), in No. 1 lecture theatre, University Engineering Laboratories, **Cambridge,** at 20.15 hrs.

January 17.—Aircraft Recognition Society, All-England Aircraft Recognition contest, at the Royal Society of Arts, 6 John Adam Street, **London,** W.C.2.

January 20.—R.Ae.S. Luton Branch, Junior Paper Evening, in the Napier senior staff canteen, **Luton Airport,** at 18.15 hrs.

WOLF EXPANSION.—Wolf Electric Tools, Ltd., has formed a new company—Ralliwolf Private, Ltd.—near Bombay, India. Wolf sales and service in India are handled by Rallis India, Ltd.

Personal Notices

BIRTHS

Gregory.—On December 17, at St. Teresa's Hospital, Wimbledon, to Ann, wife of Sqn. Ldr. L. Gregory.—a son.

Hodgkinson.—On Christmas Day, at R.A.F. Ely Hospital, to Dawn (*née* Stickler), wife of Flt. Lt. V. Hodgkinson, R.A.F. Duxford—a daughter.

Hodgkinson.—On Christmas Day, at St. Neot's, to Maureen (*née* Bull), wife of Flg. Off. W. Hodgkinson, R.A.F. Duxford—a daughter.

Holt.—On December 24, at Louise Margaret Hospital, Aldershot, to Jane (*née* Fly), wife of Sqn. Ldr. J. K. Holt—a son.

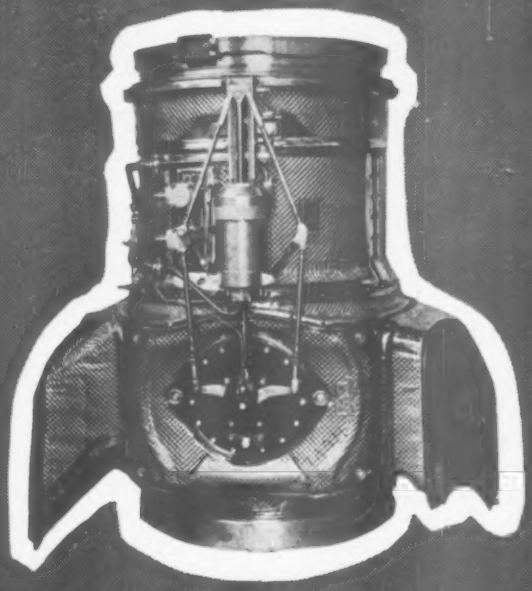
Hudson.—On December 17, at R.A.F. Thorney Island, to Flt. Lt. and Mrs. R. G. Hudson—a daughter.

Kemp.—On December 17, at Southlands Hospital, Shoreham-by-Sea, to Rosemarie (*née* Hewitt), wife of Sqn. Ldr. A. Kemp, R.A.F. (Retd.)—a son.

Worby.—On December 23, at Louise Margaret Hospital, Aldershot, to Joan, wife of Sqn. Ldr. I. A. N. Worby—a son

MARRIAGE

Guignard—Ferguson.—On December 29, at High Wycombe, Flt. Lt. J. C. Guignard, R.A.F. Farnborough, to Dr. Ann Ferguson, Radnage, Bucks.



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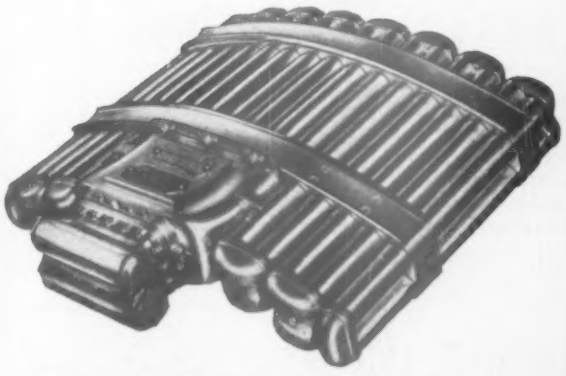

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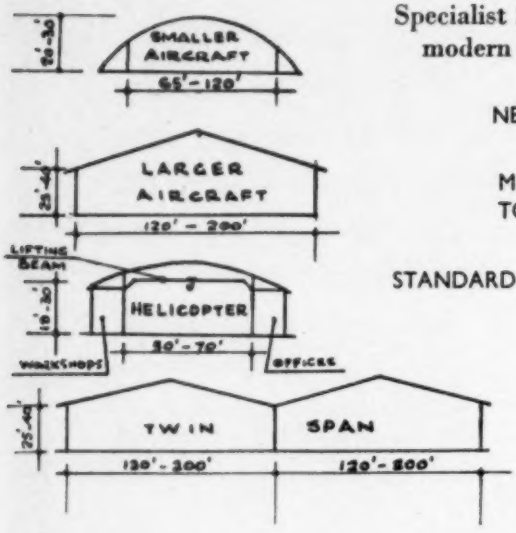
CABLE: HEYCON, LONDON

124 Victoria Street, London, S.W.1



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ENGLISH ELECTRIC

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●

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MANsion House 0444 (6 lines)
Aviacoy, Lime, London

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PRESS DAY: Classified Advertisements must normally be received at Head Office by FIRST POST THURSDAY for the following Friday week's issue. Last-minute additions and deletions are accepted by telephone from trade advertisers up to noon. Advertisements received too late for a particular issue are automatically inserted in the succeeding one unless instructions to the contrary are received.

RATES—10d. per word (minimum 12 words 10/-). Each paragraph charged separately and name and address must be paid for. Semi-displayed setting £3-12-6 per single column inch. Centred lines £1. Series discounts of 5% for 13, 10% for 26 and 15% for 52 consecutive insertions, allowed to trade advertisers.

TERMS—Strictly net and prepayable. Monthly accounts for settlement by the end of the month following insertion are allowed to trade advertisers if satisfactory references are provided.

REMITTANCES—Cheques and postal orders should be crossed and made payable to TEMPLE PRESS LIMITED and instructions sent addressed to the Manager, "The Aeroplane," Bowling Green Lane, London, E.C.1.

DEPOSIT SYSTEM—Facilities are available to readers to purchase advertised goods through "The Aeroplane." Commission 1% (minimum 2/-) on amount deposited.

BOX NUMBERS—Private advertisers desiring to have replies sent care of "The Aeroplane" may do so on payment of 1/- to cover booking and postage, plus cost of four extra words. Box Numbers must not be used for the purpose of circularizing and the Proprietors do not undertake the distribution of such matter received. To avoid mistakes in forwarding, Box Numbers should be carefully and legibly copied and replies sent to Box A000, care of "The Aeroplane," Bowling Green Lane, London, E.C.1.

THE PROPRIETORS retain the right to refuse or withdraw advertisements at their discretion and are not responsible for clerical or printers' errors, although every care is taken to avoid mistakes.

HEAD OFFICES: Bowling Green Lane, London, E.C.1, England. Telephone: Terminus 3636. Telegrams: "Pressimus London Telex." Telex: 23839.

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ROLLASONS for Tiger Moths. Croydon 5151. zzz-657

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LITCO FLIGHT AIDS, British and American instrument specialists. Corner Hall, Hemel Hempstead, Herts. Boxmoor 1564. zzz-629

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APPOINTMENTS BUREAUX

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NOTICES

AIR TRANSPORT ADVISORY COUNCIL.

THE AIR TRANSPORT ADVISORY COUNCIL give notice that they have received the undermentioned applications to operate scheduled air services:—

FROM PEGASUS AIRLINES, OF 236 OLD BEDFORD ROAD, LUTON, BEDS, for the following seasonal Normal Scheduled Services for the carriage of passengers, supplementary freight and mail at an initial frequency of up to 12 return flights weekly on each service, increasing later in accordance with traffic demand, for seven years from 1959:—

(a) with Viking aircraft from June to October each year:—

APPLICATION NO. 2402 between Luton and Rotterdam.

APPLICATION NO. 2403 between Luton and Ostend.

(b) APPLICATION NO. 2404 initially with Viking aircraft and later also with DC3 aircraft between Luton and Le Touquet from May to October each year.

FROM OVERSEAS AIR TRANSPORT (JERSEY), LTD., OF 22 BROAD STREET, ST. HELIER, JERSEY, C.I.:—

APPLICATION NO. 2401 for a seasonal U.K. Internal Service with Heron aircraft, for the carriage of passengers, supplementary freight and mail on the route Plymouth (Roborough)-Exeter (opt. tech.)-Jersey and/or Guernsey at an initial frequency of two return flights weekly increasing later in accordance with traffic demand from April to October inclusive each year for seven years from three months after date of approval.

FROM AIRLINES (JERSEY), LTD., OF STATES AIRPORT, JERSEY, C.I.:—

APPLICATION NO. 41/8 for an amendment to the terms of approval of the U.K. Internal Service which they are approved to operate on the route Manchester-Coventry-Bournemouth-Guernsey and/or Jersey-Dinard-Rennes-La Baule-Nantes (optional) so as to permit them to operate terminating services between Bournemouth and Jersey at a frequency in accordance with traffic demand instead of at a frequency of not more than two return flights daily as at present approved.

FROM BRITISH EUROPEAN AIRWAYS CORPORATION, OF KEYLINE HOUSE, RUISLIP, MIDDLESEX:—

APPLICATION NO. 437/2 for an optional traffic stop at Birmingham on the Normal Scheduled Service which the Corporation are at present authorized to operate with Viscount and Ambassador aircraft on the route Manchester-London Airport (opt.)-Barcelona or Palma at a frequency in accordance with traffic demand until March 31, 1963.

These applications will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on July 30, 1952. Any representations or objections with regard to these applications must be made in writing stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 3 Dean's Yard London, S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections. 471-1

ADCOLA
(Regd. Trade Mark)
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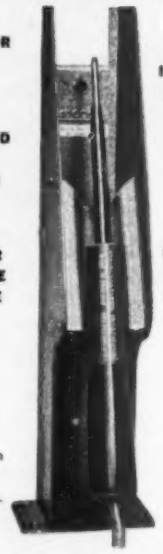

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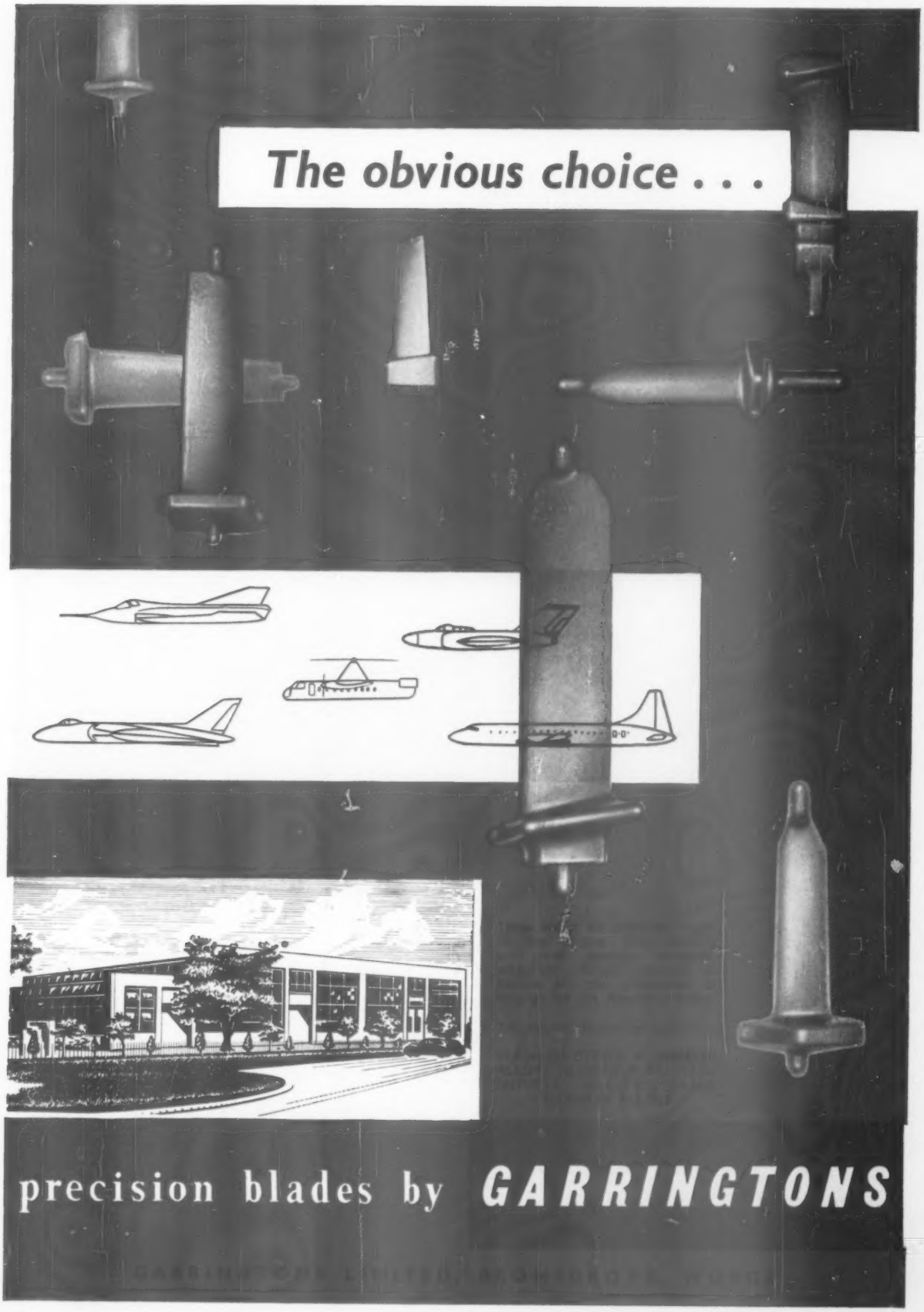
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